

A STUDY OF TYPEWRITING ERRORS
(Common Errors in Typewriting)

by

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A STUDY OF TYPEWRITING ERRORS

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CHAPTER I. INTRODUCTION

Counts(1) after having studied the curricula offerings and student elections in fifteen representative cities in the United States in 1926, made this statement: "Few subjects have risen to a position of prominence in the curriculum as rapidly as have the commercial branches. - - That commercial subjects have come to occupy a place in the program second only to English. - - - That the subject which receives the greatest amount of emphasis is typewriting. Almost one-third of the time is given to the acquisition of skill in this subject."

The schools are being called upon to train an ever increasing number of typists. The keynote of the philosophy underlying the commercial education today is, that a closer correlation between training and life should exist. The philosophy of such commercial educationists as Dr. F. G. Nichols(2) of the Harvard Graduate School of Business,

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1. Counts, Geo. S., The Senior High School Curriculum, Supplementary Educational Monographs, University of Chicago, Chicago, pp. 92-3, 1926.
 2. Nichols, F. G., A New Conception of Office Practice, Harvard Bulletin in Education, No. 12, pp. 19-41, 1927.

reflects a changing attitude toward training for minor positions in business. Typewriting is one aspect of this great problem.

With the recent rise of the United States as a foremost commercial nation of the world, there has come a tremendous increase in the demand for commercial education, and especially for trained typists. Neither the teachers, nor the school administrators, nor the educational philosophers, have, until recently, grasped the magnitude of the problem. Consequently commercial education had a low status because of inadequately trained teachers, and lack of state and national government initiative in the matter of recognition of the problem. Other countries, with the exception of England, recognized a need for commercial training in its larger sense, simultaneously with the evolution of training for commercial progress in the commerce of the world; that is, the national governments of these different countries for the most part took the lead in determining the policy of commercial education. Especially was this true of a modern nation like Japan.

It would be difficult to estimate the influence of the typewriter, not only on modern business, but on modern life in the broad sense. It has transformed business activities everywhere. It has been estimated that in 1927 there are at least 5,000,000 typewriters in use throughout the world, 80 per cent of which were made in the United

States. No less than 158 languages are written on those machines. The following statement made on June 26, 1925, presages the trend in the manufacturing aspect of the typewriter business: "The typewriting industry, although fifty years old, is still in its infancy. Today the annual output of the world is 600,000 large, and 200,000 portable typewriters. This is against an annual output of 4,000,000 automobiles. Today there are 4,000,000 large and 750,000 portable typewriters, and 19,000,000 automobiles in use throughout the world. The typewriter business is one of the oldest American-controlled world industries."(1)

The typewriter has done more than anything else to create uniformity in business matters and communication. It has rendered the ideal of correct spelling a thing impossible to avoid, hence the inception of the idea for the study of typewriting errors by the author. It has trained even the careless operator in a more or less perfect school of mechanics. It has transformed our entire modern system of commercial education.

"But perhaps the greatest of its achievements is the transformation it has wrought in our social order. A strong prejudice existed forty years ago against the employment of women in business. The typewriter came, soon to be followed by the girl typist, who blazed the way for other

1. Wall Street Journal, New York, p. 5, June 26, 1925.

women to enter every department of business life."(1)

Five years ago while the author was an instructor in the Central High School at Tulsa, Oklahoma, she began work on the study of errors made by students in learning to typewrite. Interesting problems came to light. For the last two years the writer has been teaching typewriting in the College of Business Administration at the University of Washington. This thesis is an outgrowth of the high school and university experience of teaching typewriting, coupled with some practical work in the business world, and supplemented by a careful investigation of much of the literature available on the subject.

If typists could always be sure of spelling the most common words correctly it would mean a great saving of time and energy for themselves and for employers. In Chapter IV of this study, it is shown by computation that the average number of errors made by first-year students in the 1927 Washington State Typewriting Contest was 28, and by second-year students, 25.5. One-third of all the errors made by second-year students, on words occurring in the Ayres Spelling Scale, were made on the first 150 words; and one-half of the errors occurred in the first 250 words contained in the Ayres Spelling Scale. A similar situation

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1. Reiley, A. C., Honoring the Inventor of the Typewriter (radio lecture) at the Unveiling of the Monument to Christopher Latham Sholes in Milwaukee, Remington Pamphlet, p. 6, 1923.

was true for the first-year students. Thus there is a vital need for the elimination of error waste in type-writing production for the words of easy spelling difficulty.

As Jones(1) found "Spelling Demons", so the author believes that "Typewriter Demons" exist. This study represents a search within the Ayres Spelling Scale of the One Thousand Most Common Words(2) to determine the most difficult words to spell on the typewriter, according to frequency of errors and coefficients of typewriting difficulty. The selection by the author has been arrived at by computation and by the application of the statistical method.

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1. Haliburton, M. W., Furguson, A. C., Dvorak, August, The Standard Speller, Book Two, Southern Pub. Co., Dallas, Texas, p. 181, 1925.
 2. Ayres, Leonard P., Ayres Measurement for Ability in Spelling, Russell Sage Foundation, New York, pp. 12-20, 1915.

CHAPTER II. PURPOSE AND METHOD

GENERAL PURPOSE

The general purpose of this study is to investigate typewriting errors with the hope that the results may lead to the better teaching of typewriting and to a saving in student time. This is to be accomplished by a study of the following points:

A. An investigation of most of the literature having to do with typewriting and typewriting studies, which is available at the University of Washington, and the arranging of it under the following heads:

1. Evolution of the typewriter.
2. Brief history of commercial education.
3. Review of teaching methods in typewriting.
4. Literature pertaining to typewriting and typewriting studies.

B. A comparison of typewriting errors made by seventy-nine first-year, and eighty-four second-year high school students in the Third Annual Washington State Typewriting Contest, held on May 7, 1927, on the Ayres

Spelling Scale of One Thousand Most Common Words, including a computation of the gain in accuracy by the second-year students over that of the first-year high school students.

C. An investigation of the typewriting errors made by forty-seven university students in beginning typewriting on the words contained in the Ayres Spelling Scale of One Thousand Most Common Words.

D. A comparison of spelling and typewriting difficulty.

E. A compilation of a list of "Typewriting Demons", which might well be given particular stress in the early training period of typewriting, or in the habit-forming period, with excellent results of gain in accuracy.

METHOD

The first purpose, an investigation of the literature relative to the subject, was carried out by compiling as complete a bibliography as possible of all the materials relative to typewriting and commercial education. This was partly accomplished through the courtesy of coworkers in the field, of the Typewriter Companion, of publishers of commercial text books, and from such sources as the Reader's Guide. Then most of the material available was reviewed and arranged under the following heads;

1. Evolution of the Typewriter.
2. Brief history of Commercial Education.
3. Review of Teaching Methods in Typewriting.
4. Review of literature relative to typewriting and typewriting studies.

The second purpose, a comparison of typewriting errors made by first and second-year high school students, was accomplished by making an investigation of the typewriting errors made by 163 high school students in the Third Annual Washington State Typewriting Contest held at the University of Washington on May 7, 1927, under the local direction of Mr. Frank Hamack of the College of

Business Administration. This contest was a sanctioned one; that is, the contest materials were secured from Mr. J. N. Kimball, International Contest Manager, and the papers written in the contest will be kept on file in the New York office of Mr. Kimball for one year.

The typewriting contest was participated in by the following groups of students: "Class I, which is open to high school students, regularly enrolled in the high school from which entered for a period of sixty days prior to the contest, and who had not received any instruction in typewriting prior to September 1, 1926. Class II, Open to high school students regularly enrolled in high school from which entered for a period of sixty days prior to the contest, and who had received instruction prior to September, 1926." (1)

The papers of seventy-nine first-year and eighty-four second-year typewriting students were investigated. A few of the students' records were not studied due to an oversight in listing the errors from the original papers before they were sent to New York.

The International Typewriting Contest Rules were used in marking the papers. Such errors as paragraphing and irregular lines could not be compared with the Ayres

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1. Hamack, F. H., "Rules and Regulations for the Third Annual Washington State Typewriting Contest," Mimeographed Bulletin, College of Business Administration, University of Washington, February 1, 1927.

Spelling Scale so they have been disregarded in this study.

There may be some amplification of errors due to the assumption that all students wrote through the entire contest copy once, or only once in the fifteen minutes. In that event, if it were true, the amplification would in all probability be offset by the fact that only the contest papers above thirty net in Class I, first-year, and fifty net in Class II, second-year, high school students were rechecked by the official contest checkers. The errors on the papers below thirty and fifty net, respectively, were those marked wrong by the individual contestants in the preliminary checking immediately following the contest. No contestant in the preliminary contest marked his own paper or even had a chance to see it after he had written it. The identification of the papers was by number only, and the individual student's identification number and name were attached to the original envelope containing the contestant's typewritten papers after the papers were checked. Consequently the official checkers did not know whose papers they were marking.

After the final lists of errors from both classes were collected, they were compared with the Ayres Spelling Scale of the One Thousand Most Common Words. The following steps were necessary in order to compile the data:

1. The Ayres Spelling Scale of One Thousand Most Common Words was typed.

2. The frequency of occurrence of words in Ayres Spelling Scale was determined for the contest copy entitled, "His First Case," which was used by all of the first and second-year high school students in the state typewriting contest.

3. The total frequency of occurrence of words in Ayres Spelling Scale was computed for the entire contest copy used by the seventy-nine first-year students.

4. The total number of errors in the fifteen-minute contest was determined for the seventy-nine first-year students on words contained in the Ayres Spelling Scale.

5. The percentage of errors was computed for the seventy-nine first-year students on words contained in the Ayres Spelling Scale by dividing the frequency of errors by the total number of errors made on the given word.

6. The total frequency of occurrence of words in the Ayres Spelling Scale was computed for the entire copy used by the eighty-four second-year students.

7. The total number of errors made by eighty-four second-year students in fifteen minutes was listed.

8. The percentage of errors made by eighty-four second-year students was computed.

9. The gain in accuracy by second-year students was computed.

The third purpose,--an investigation of typewriting errors made by university students, was accomplished by

analyzing typewriting errors made by forty-seven university students in beginning typewriting for a period of eight weeks.

On the first day of each quarter the students were asked to fill in a questionnaire (1) including the following data: Name, age, college, major, minor, number of credit and non-credit hours, number of hours of outside work, previous typewriting experience, if any, items of health, and a drawing of the outline of each hand (data not assembled) and any other information that was pertinent to individual success in learning typewriting. This plan helped to orient the student with the instructor.

This phase of the investigation involved the assembling of errors from approximately 3000 pages of typewritten matter, covering parts I and II of "New Rational Typewriting," (2) together with an average daily speed test marked by International Typewriting Contest Rules, during the last half of the quarter, varying in length from one to fifteen minutes.

The winter quarter students were asked not only to summarize their daily errors, but finally to make a complete list of them for the eight weeks. The papers of these students were rechecked, and it was evident that all

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1. See Appendix 1.
 2. SoRelle, Rupert P., The New Rational Typewriting, Gregg Publishing Co., Chicago, pp. 1-58, 1923.

of the errors had not been found. Occasionally the students had time only to make a hurried check, if the test came near the close of the hour. About a third of the papers of the spring-quarter students were rescored. In all probability, the number of errors for the different words in the "Ayers Spelling Scale" would have been amplified somewhat if an absolutely accurate check had been made for these students, as was done for the winter students.

The assignments in the beginning of the text were written several times while the latter ones were often written only once.

The author was primarily interested in the reactions made by the student during his first hour of writing on a given assignment, and especially in the first copy written, although there is no separate record of that achievement in this study.

Each student was requested to arrange his weekly budget in the order written with a summary of errors on top, and to keep the text assignment and speed tests in separate notebooks. Within the summary the wrong word was written as it occurred in the copy, then a correct spelling of the word was written afterward. Mimeographed summary sheets were handed out for this purpose. Students were urged to check their work at the close of each hour, in order that

they might notice their "typewriting demons" and strive to conquer them. Some of the students thought that the summarizing of errors for the week was too much work, but before the respective quarters were over, many could see merit in trying to diagnose the respective difficulties with relation to learning to typewrite accurately.

Some general drills were given at the beginning of the class hour, usually, but particular stress was placed on the minute-a-day individual supervision. Weak students were urged to stress their shortcomings in typewriting in much the same fashion that difficult measures of a musical composition are worked up.

Spelling is perhaps the most common criterion for judging achievement in either the hand or machine methods of writing. That being the case, the author of this investigation studied the words misspelled by forty-seven university students in beginning typewriting, and compared them with the Ayres Spelling Scale of the One Thousand Most Common Words.

The original plan of the author was to include a chapter on errors found in additional words not included in the Ayres Spelling Scale; a chapter on the errors with relation to the International Typewriting Contest Rules.

After the final lists of errors from the winter, and spring quarter university students were assembled, they

were compared with the Ayres Spelling Scale of the One Thousand Most Common Words. The following procedure was necessary in order to compile the data:

1. A typewritten list was made of the Ayres Spelling Scale, together with the frequency of use per 100,000 running words, and then the words were ranked in order of use.
2. The total number of errors made by forty-seven university students on textbook and speed test assignments in a period of eight weeks was noted.
3. The number of errors on words in the Ayres Spelling Scale, beginning with a rank of one for the word "the" on which the most errors were ranked.
4. The coefficient of typewriting difficulty was computed by dividing the numerical rank of words in the Ayres Spelling Scale by the numerical rank in the error column. This was done by the use of a slide rule, hence there may be some variation in the second figures following the decimal point.

The fourth purpose,--a comparison of typewriting and spelling difficulty, was determined by the application of the statistical method which included the following steps:

1. The words in the Ayres Spelling Scale were ranked by coefficients of difficulty; beginning with a rank of one for the word "effort" because it had the highest

coefficient of difficulty, and so on for the whole Ayres list.

2. The words found in the Ayres Spelling Scale were listed by frequency of use, and by rank in errors.

3. The words in the Ayres Spelling Scale were listed by rank in use.

4. The spelling difficulty of words in the Ayres Spelling Scale was listed, using the Ayres Formula.(1)

The above data having been compiled, the task of locating the difficult words to write on the typewriter with relation to the Ayres Spelling Scale, became an easy matter.

The fifth purpose, a compilation of "Typewriting demons", was accomplished by listing the words that were common to the group with high coefficients of typewriting difficulty, and to the group with a high error rank.

1. Ayres, Leonard P., A Measuring Scale for Ability in Spelling, Russell Sage Foundation, New York, pp. 28, 42-50, 1911.

CHAPTER III. SURVEY OF LITERATURE RELATIVE TO TYPEWRITING

1. EVOLUTION OF THE TYPEWRITER

The history of the typewriter dates back more than 200 years. It began with the year 1714, when "Henry Mill, the engineer to the New River Water Co., obtained a patent for a machine which he stated he 'had brought to perfection at great pains and expense,' and the object of which was to impress letters on paper as in writing." (1) From that time down to the present there have been 286 different writing machines invented. (2) An embossing machine was invented in France in 1734. The next move was by M. X. Progin of Marselles, France, for a "Typographic machine or pen" which was the first to use typebars. (3) In the United States, about the year 1845, Charles Thurber invented a machine using the same carriage principle that is used in

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1. Mares, Geo. Carl, The History of the Typewriter, Guilbert Pitman, 85 Fleet Street, London, pp. 17, 18, 41, 1909.
 2. Idem
 3. Idem.

the best typewriters in 1927. During the interim between 1845 and 1867 numerous other writing machines were invented. That of Mr. Pratt of Alabama, inspired the Scientific American to publish an article that was the direct cause of the invention of the typewriter used today. This typewriter was proclaimed, "A machine by which it is assumed that a man may print his thoughts twice as fast as he can write them, and with the advantage of the legibility, compactness, and neatness of print, has lately been exhibited before the London Society of Arts. - - - The learning of penmanship in schools will be reduced to the acquirement of the art of writing one's own signature, and playing on the literary piano, or rather its improved successors."(1)

The article above mentioned was the inspiration for Mr. Christopher Latham Sholes, a journalist who had held high positions in the commonwealth of Wisconsin, to try to invent a machine that would print serial numbers on blank books. One day his friend, Mr. Glidden, said, "Why cannot such a machine be made that will write letters and words, and not figures only"? Consequently in 1867, Sholes began active work on what proved to be a practical typewriter by the year 1875. The manufacturing problem was a formidable one, and after much persuasion, the famous gunmakers of Ilion, New York, known as E. Remington & Sons, contracted to manufacture typewriters and to sell them for

1. Idem

\$125 apiece - a large amount of money in those days. It is said that Mark Twain, one of the first buyers, called the machine "a curiosity-breeding little joker." There were no typists in the early days and no means for training them, so typewriting was introduced into the private business colleges. After 1873 when the first machine was made that printed both small letters and capitals, the progress of the typewriter was steady. Later Mr. Sholes sold his rights to the Remington Armoury at Ilion, New York, and since then the typewriter has been known as the Remington machine. The original keyboard was very different than that of today; in fact, it seems to have just grown up without any particular purpose except to write in printed form.

The Smith Premier having survived the years, this story is told of it: "That one of the machines were aboard the ill-fated Maine, when the vessel was blown up in Havana Harbor; that it lay in the water for a week and was then fished up, little the worse for its ducking; and that it is now among the most valued possessions of its makers - to be gazed at by future generations of young Americans."(1)

At the present time a few of the electrically driven typewriters are practical, although not in common use. The invoicing and daybook entry machines of today are

1. Mares, Geo. Carl, The History of the Typewriter, pp.84-5, Guilbert, Pitman, 85 Fleet Street, London, 1909.

other outgrowths of the typewriter.

Several shorthand machines have existed, including the stenotype, which, mechanically successful, flourished during the last decade.

The Underwood typewriter, embodying all the advantages of the early machines for the blind, as well as being a visible writer, made its appearance on the American market about 1897. A few years later came the Royal typewriter; and the different portables.

At the unveiling of the Sholes Memorial, more than fifty years after Sholes' great invention, there were present the first man typist, Mr. Charles E. Weller, and the first woman typist, Mrs. Lillian Sholes Fortier, who unveiled the monument in Milwaukee. "Among the many subscribers to this fund were a large number of women typists of America who have made this gracious recognition of the service rendered by Sholes in opening to women the doors of business life. It is hoped that the name of Christopher Latham Sholes will be added to the list of the first great American inventors in the New York University Hall of Fame when its next selections are made in 1928."(1)

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1. Reiley, A. C., Honoring the Inventor of the Typewriter (Radio Lecture) at the Unveiling of the Monument to Christopher Latham Sholes in Milwaukee, Remington pamphlet, p. 6, 1923.

2. BRIEF HISTORY OF COMMERCIAL EDUCATION

"Commercial education is that form of vocational education which is arranged to fit young people for any kind of trading and exchange on their own account; any kind of office employment, such as bookkeeping, stenography, typewriting, and all kinds of clerkship; also for the more advanced positions as secretaries, salesmen, and business executives."(1)

From the most recent data available,(2) approximately 41.31 per cent of the high school students of the United States were pursuing commercial studies in 1922. Out of this number, 13 per cent were studying typewriting. In 1915(3) it was estimated that probably one quarter of all the secondary school pupils in the United States were taking commercial courses. The increase in demand for commercial subjects increased in round numbers 8 per cent in seven years.

Even with the recent advancement of the United States to first place among the commercial nations of the world, "Commerical education still lies more or less under the suspicion of being, in the words of an English writer, 'cheap

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1. Smith, E. Newton, Commercial Education, Education, Vol. XXXVII, pp. 51-61, 1916-17.
 2. Biennial Survey of Education, Department of the Interior, Bureau of Education Bulletin, No. 14, Vol. II, p. 26, 1920-22, 1924.
 3. Thompson, F. V., Report of Bureau of Education, Vol. I, p. 279, 1915.

and nasty'. The very word commercial in the minds of many educational administrators has implied unworthiness. - - - This system of instruction 'just grew'. The first schools were the outgrowth of the work of itinerant teachers of writing, who gathered mature pupils and trained them in penmanship and later in bookkeeping and business arithmetic. - - - Many of the men who had lost their educational opportunities by going to the Civil War, on their return took short courses in these commercial schools. A change was introduced into the business schools about 1870, when the typewriter came into general use, With the typewriter, there was the application of shorthand writing which had been perfected earlier. The training of stenographers made necessary the introduction of such rational subjects as spelling, grammar, and commercial correspondence."(1)

In the eighties there were relatively fewer mature men and women seeking an education, so the private schools appealed to the younger students, with the result of the establishment of short courses of a technical character in the public schools. As time went on two changes developed in the philosophy of commercial education: one, the tendency to lengthen the time; the other, to raise the educational standard. The next improvement came from the higher business schools with the Wharton School of Finance and Economics,

1. Herrick, Cheesman A., Commercial Education in American Secondary Schools, Educational Review, Vol. 52, p. 248, 1916.

established in 1881, taking the lead. Among the universities, Michigan, Wisconsin, Chicago, California, and Illinois were in the lead. Then the Amos Truck School at Dartmouth established a professional course for business, and finally within very recent years came the Harvard Graduate School of Business Administration. Among the nations of the world, Germany, France, Italy, Russia, Switzerland and Japan are in the lead, while England was the most backward of any of the great nations to provide this type of training until after the World War.

One of the interesting things in the rise of commercial education was that the Business Educators' Association, composed of private school leaders in 1878, became the Department of Business Education of the National Education Association in 1892. At the Detroit meeting in 1901 a committee of nine was appointed to prepare a monograph on the subject of "Commercial Education in the High Schools." In 1903 "the final report of the committee was accepted and printed as Bulletin No. 23, of the University of the State of New York."(1) The main objective was the welfare of the student who went direct to his life work from the high school. The report was unique, especially in the amount of academic and social sciences proposed.

In 1915 the "second pronouncement"(2) of the National Education Association indicated that technical subjects

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1. Rowe, H. M., Courses of Study and Preparation of Teachers for Commercial Schools, Addresses and Proceedings of the N. E. A., pp. 878-9, 1907.
 2. Lyons, Leverett S., Education for Business, University of Chicago Press, Chicago, pp. 549-55, 1922.

were to be the core of the commercial course all through the high school. In 1919 the report called "Business Education in Secondary Schools", (1) published by the National Education Association, was a compromise of the first two reports on commercial education, and a longer and more diversified curriculum was proposed, including retail selling. This change was sorely needed, due to an increase of "1,728,35 per cent" in commercial school population from 1893 to 1919.

The plan of the National Council of Education was to reach down and save the junior high school student by giving exploratory courses, foundational training in the school studies, and finally a "liberal" commercial course in the senior high school through which the student would be able to function more completely in life.

The phenomenal growth of commercial education is shown by the orientation, summarization, and evaluation of the whole movement in business education as pointed out by Counts(3) in the statement: "During the history of secondary education few subjects have risen to a position of prominence in the curriculum as rapidly as have the commercial branches. Although this division of subject matter was repre-

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1. Business Education in Secondary Schools, Published by Bureau of Education, N. E. A., Bulletin No. 55, pp. 1-68, 1919.
 2. Lyons, L. S., Education for Business, University of Chicago Press, Chicago, p. 5, 1922.
 3. Counts, George S., The Senior High School Curriculum, University of Chicago Press, Supplementary Educational Monographs, No. 29, p. 93, 1926.

sented in the first public high school in 1821, it received little emphasis until the close of the Nineteenth Century. Schools under private management providing training for clerical positions had appeared somewhat earlier, but the high school can hardly be said seriously to have assumed the burden of providing this training before the late nineties. In the meantime, the commercial subjects have come to occupy a place in the program of studies second only to English, and 12.4 per cent of the total recitation time in the high schools of the fifteen cities is devoted to these subjects. The commercial curriculum introduced into the high school which may be said to have thrived. Its popularity is probably to be explained by the growth of a complex commercial civilization, which requires a large amount of clerical service, and by the changing status of woman, who has cut many bonds holding her in the home. These two changes proceeding together have created a heavy demand for the training of girls in clerical skill. First the private commercial college, and later, the public high school, sought to meet this demand."

This growth is also shown by the fact that a national survey is being made under the direction of Dr. E. W. Barnhart, Director of Commercial Education under the Smith-Hughes Act.

A third proof is furnished by the compilation of a digest of researches in commercial education under the direc-

tion of Dr. E. G. Blackstone(1) of the University of Iowa; together with a five-year continuous survey of commercial education in the State of Iowa, under the guidance of the Iowa Commercial Teachers' Association, and the University of Iowa, with Dr. E. G. Blackstone in charge. These three movements reflect the latest trends in Commercial Education among the leading educationists in the field.

3. HISTORY OF METHODS OF TEACHING TYPEWRITING

A. METHODS OF TEACHING

In its very earliest days the typewriter was known as the "literary piano." Out of that expression grew the idea regarding its manipulation - the so-called "touch" method by which the eye remains fixed on the copy to be written and the fingers seek the proper keys unaided by the eye.

The "touch" system of typewriting was first introduced about the year 1880, although it was not used in a practical way until perhaps twenty years later. It was said of Mr. Frank E. McGurkin, the first touch operator, that "after a few months he became able to write upward of ninety words a minute, and that dictated matter was written about as speedily when he was blindfolded as when his eyes were

1. Blackstone, E. G., Report on Research in Commercial Education, at the N. E. A., Philadelphia, mimeographed copy, 1926.

uncovered."(1) Waldo also gives the following interesting information: that shortly after McGurkin's achievement in the operation of the typewriter, Mrs. M. V. Longley of Cincinnati, published a little instruction book entitled, "Remington Typewriter Lessons"; to Mr. H. V. Rowel, belongs the credit of being the first typewriter expert to see the possible magnitude of the movement, and the importance of its being brought into general use in the business schools; the suggestive name "touch" typewriting was given to the system by Mr. Bates Torrey, who seems to have first published it in his book, "A Manual of Practical Typewriting," issued in 1889; later additions to the literature of the "touch" method were, "Typewriting by Touch," by B. J. Griffin, Springfield, Mass., 1891; "Typewriting Systematized," by W. H. Lowe, Omaha, Nebraska, 1892, and numerous other books came out from time to time.

With the coming of typewriting as a subject of the high school curriculum, came the problem of the correct age at which to begin instruction.

In 1901-2 this statement was made by an educator: "It has been proven over and over again that the child who knows his letters and can recognize their part in the formation of words is old enough to reproduce these letters and words on the typewriter, so that the typewriting age and the

1. Waldo, Frank. The Educational Use of the Typewriter, Education, Vol. XXII, pp.491-2.

school age are coincident. Virtuosity on the typewriter, as in the case of musical instruments, in most cases can be attained only by an early beginning. One reason why the average speed of the present typist remains so low is that the operators too frequently do not begin to use the machine until they have reached adult age. We all know how much of the skill of children in reading script is behind their ability to read printing. The use of the typewriter in learning the letters of the alphabet is really but a return to the system of first learning to print, only in this case the typewriter does the mechanical work under the controlling influence of the child."(1) There has been much controversy over the proper age for taking up the study, and until recently typewriting was offered only in the last two years of the secondary school. Now it is offered in the junior high school.

In 1907 Mr. James S. Curry of the High School of Commerce, Cleveland, Ohio, stated the philosophy of teaching methods in typewriting: "That it is a safe rule of education to begin with the easy and end with the difficult."(2) That is, it is better to begin with the index fingers because they are more easily controlled than are the other fingers, especially the third and fourth ones. Today the leading auth-

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1. Waldo, Frank. Educational Uses of the Typewriter, Education, Vol. XXII, PP. 486-7, 1901-2.
 2. Curry, James S., Teaching Typewriting for the Best Results, N. E. A. Proceedings, p. 834, 1911.

ors of typewriting texts seem to fall into two groups, those who start with the index fingers, and those who start with the weak fingers.

By 1914 the criterion of the "accuracy at any price" method seemed quite firmly entrenched in the teaching of typewriting. Such statements as this one were typical: "The habit of accuracy must be developed at the very start, by rejecting all work that shows any errors and compelling the student to write it. The same rule would apply to neatness. Any copy that shows erasures or finger marks or is improperly spaced should be rejected. It is true that in practical business we are not so severe in the matter of erasures. But it must be remembered that if we want to check the habit of carelessness, we must prevent its development at its incipency, and this can be accomplished only by rejecting work that is not reasonably perfect."⁽¹⁾ As a result, while no intelligence tests were given, a highly selective process functioned. Commercial departments in some high schools having as many as a third of their students failing, began to seek the reasons back of this tremendous waste. Consequently the use of the commercial department as a dumping ground for failures in other departments of the high school was questioned, also teachers and psychologists began to delve into the fundamental problems of learning

1. Kahn, Joseph, and Klein, Joseph J., Principles and Methods in Commercial Education, Macmillan, New York, p. 397, 1914.

typewriting for its own sake.

In 1916 a new method was originated wherein the textbook lessons were reproduced on slides and thrown on a screen in a darkened room until the pupil had mastered the keyboard, or until he was able to associate a particular finger with a corresponding key. Beygrau(2) said that "this method takes less time than any other method." However, so far as the author knows, no scientific experiment has been carried out to actually measure and compare the results of the above method with others; and the method is not in common use.

It is significant, that in the typewriting textbooks written since 1920 there is more or less application of the findings arrived at by psychologists, and by the best teachers in the field. For instance such books as the following demonstrate a tremendous improvement in content and method:

1. Ross, J. W. Intensive Touch Typewriting, H. M. Rowe Company, Chicago, 1921, 169 pp.
2. Fritz, Ross L., and Eldridge, E. H. Expert Typewriting, American Book Company, Chicago, 1921, 181 pp.
3. Adams, Elizabeth S. Junior Typewriting, Gregg Publishing Co., Chicago, 1923, 95 pp.
4. SoRelle, Rupert P. The New Rational Typewriting, Gregg Publishing Co., Chicago, 1923, 152 pp.

1. Beygrau, F. R., Typewriting in the Public Schools, N. E. A. Proceedings, Vol. 54, pp. 367-70, 1916.

5. Depew, Ollie. A Scientific Course in Typewriting, Allyn & Bacon, Chicago, 1923, 123 pp.

6. Wiese, E. G., and Coover, J. E. The Wiese-Coover, Kinesthetic Method of Learning Touch Typing, H. M. Rowe Co., Chicago, 1924, 105 pp.

7. Harned, Wm. T. Junior Typewriting Studies, 1926, 93 pp., and, Typewriting Studies, Ginn & Co., 1926, 128 pp.

8. Reigner, J. E. Applied Typing, H. M. Rowe Co., Chicago, 1925, 136 pp.

9. Davidson, Jessie, and Huff, Nettie E. Correlated Typing, Accredited Schools Supply Co., Des Moines, Ia., 1926, 186 pp.

10. Ross, J. W. Essentials of Typing, H. M. Rowe Co., Baltimore, 1927, 93 pp.

11. Lessenberry, D. D. Twentieth Century Touch Typewriting, South-Western Publishing Co., Cincinnati, 1927, 144 pp.

B. CONTESTS

Perhaps two of the greatest factors in raising the standards of typewriting have been the monthly speed tests sent out by the different typewriting companies, and the International Typewriting Contest originated by J. N. Kimball(1),

1. Cody, Sherwin, Commercial Tests and How to Use Them, World Book Co., Yonkers-on-the-Hudson, p. 37, 1920.

"who has lived to see the highest net speed of 87 words a minute for one hour in 1907" increased to "132 net words a minute in 1926, by George L. Hossfield."(1)

C. CURRICULUM

The time allowed for typewriting in the curriculum of more than 400 high schools in 1910 was "two school years of 5.2 periods per week for shorthand, and 5.3 periods for typewriting. The large majority of schools put the subjects chiefly in the second year and in the third year."(2)

In 1919 the results of another survey of Commercial Education in the Public Schools of the United States showed that the lack of uniformity in typewriting was not as pronounced as that in other commercial subjects, and that "of the 112 schools reporting, 48.2 per cent had two years for their typewriting course."(3)

- In 1926 Counts found in his curriculum survey of fifteen representative cities that: 1. "Typewriting is sometimes a first-year subject, but it is customarily introduced in the second year and taught in the subsequent years."(4)
Counts in Table XLIII(5) gives the percentage distribution

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1. Kimball, J. N., Veritas, Underwood Typewriter Co., New York, Supplement, p. 2, 1926.
 2. Lakey, Frank E., How to Make Commercial Courses More Efficient, N. E. A. Proceedings, pp. 839-45, 1910.
 3. Lyon, Leverett, A Survey of Commercial Education in the Public Schools of the United States, University of Chicago Press, Chicago, p. 15, 1919.
 4. Idem.
 5. Counts, G. S., The Senior High School Curriculum, University of Chicago Press, Chicago, pp. 95-6, 1926.

of first-year typewriting time to each of the different divisions of the subject:

TABLE XLIII. PERCENTAGE OF THE TOTAL FIRST-YEAR TYPEWRITING TIME DEVOTED TO EACH OF THE DIFFERENT DIVISIONS OF THE SUBJECT

Division	Berkeley	Detroit	Joliet	Lincoln	Pueblo	Rochester	St. Louis	Trenton	Average
Technique and drill	23	50	31	55	50	75	75	25	48
Letters	19	15	45	25	50	0	25	0	22
Centering and Arrangement	35	17	0	10	0	0	0	15	10
Straight Copy Work	23	18	0	10	0	25	0	60	17
Office Routine	0	0	14	0	0	0	0	0	2
Speed Work	<u>0</u>	<u>0</u>	<u>10</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
TOTAL	100	100	100	100	100	100	100	100	100

D. COLLEGE CREDIT

In 1902, the Association of Colleges and Universities voted "to prepare definitions of at least one unit's value in commercial and other courses,"(1) and by 1908 com-

1. Lyon, Leverett S., A Survey of Commercial Education in the Public Schools of the United States, University of Chicago Press, Chicago, p. 15, 1919.

mercial subjects were recognized by that association. Southern and Western colleges were quicker to grant recognition for typewriting as a college entrance subject than the Eastern colleges were, but in most sections of the United States there has been a tremendous increase in the number of colleges recognizing commercial work. In 1926, Brand(1) found, by a survey, that 65 colleges and universities gave one-half unit, 191 gave one unit, 47 gave one and one-half unit, and 5 gave three or more entrance units for typewriting; that well over half of the 634 colleges and universities throughout the United States and its possessions allowed college credit; and that 71 of the colleges allowed credit toward an A. B., or a B. S. degree in "content courses" in typewriting.

4. REVIEW SCIENTIFIC STUDIES RELATING TO ERRORS IN TYPEWRITING

The author has been unable to find any experiments exactly like the study attempted in this thesis, hence a part of the literature reviewed deals with typewriting errors, and their relation to the learning curve, rather than to typewriting for its own sake, but there is both a direct and an indirect application.

Correct spelling has been used in this study as a

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1. Brand, Louis, College Credit for Shorthand, Typewriting, and Office Practice, Gregg Educational Monographs, New York, p. 18, 1926.

criterion for judging typing efficiency because a poor "spelling consciousness" blights the hopes of many a typist. This investigation shows the frequency of errors and their coefficients of typewriting difficulty with relation to the Ayres Spelling Scale of the One Thousand Most Common Words for a group of high school and university students. The question still unsolved is how well these students could spell away from the typewriter, and whether most of the errors were made in transition from handwriting to typewriting. The chronological presentation of material has been used in this investigation in order to show the progress of experimental studies with relation to typewriting.

The earliest psychological experimentation involving typewriting, was in the study of the learning process. Typed papers from the viewpoint of typewriting were not regarded as material within themselves. The typewriting errors received very little attention from the standpoint of objective testing to find out which words and letters were giving difficulty. The classic experiment applied to typewriting in the field of the learning curve is that of Book(1) (1908) on the psychology of skill.

Bryan and Harter,(2) pioneers in the study of practice curves, indicated methods of investigation, and made in-

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1. Book, W. F., The Psychology of Skill, University of Montana, Missoula, Mont., pp. 75-100, 1908.
 2. Bryan, W. L., and Harter, N., Studies on the Telegraphic Language, Psychological Review, Vol. VI, pp. 350-74, 1899.

vestigations of the transition from lower to higher habits of learning by means of studying the receiving curves for telegraphy; that is, transition from letters to words and to connected discourse. The plan of teaching the use of letters, then words, and then discourse, has been, and is the predominant method of teaching typewriting at the present time, although there is some tendency toward using comprehensive units from the start.

In 1907, Swift(1) said: "In the curve of errors, that which attracts attention is the remarkable persistence and regularity of the mistakes. The tracing shows that the mass of errors lies between one and two per cent, with an average error of a little over one and one-half per cent. These errors, again, gradually diminish, during the entire period, at the approximate rate of eight-thousandths of one per cent per day. In the memory tests the average per cent of errors was found to be one and thirty-four hundredths, slightly less than that of the regular practice tests. Examination of the written exercises showed that the errors always came in bunches, and, when in threes, one group was near the beginning, another about the middle, and the third toward the end. Sometimes there were only two groups, but after the mistakes were marked with red ink, the alternation of spotted spaces with those free from marks was striking."

1. Swift, E. J., The Learning Process, Psychological Bulletin No. 4, Vol. IV, pp. 303-10, 1907.

There was no connection between the number of errors and the repetition of copy so far as a particular student was concerned; but increased speed was usually associated with a greater number of errors, though the proportional increase was not the same. The author would like to see further investigation of the proportional increase of errors versus speed.

In 1913 Thorndike(1) came to the conclusion, after analyzing the records made by Hill and Rejall in 1907-1908, "that forty hours of well-distributed practice will enable an intelligent student to copy on the machine approximately twice as fast as he can by hand." That "there was a very great permanence of learning" because the same students were tested on the same material four and one-half years later, and only about one-fifth of the time was required to attain the same speed as had been originally attained by thirty hours of practice.

About the same time that Thorndike was making the above study, Starch(2) (1913) found through investigation of correlations among abilities in school studies that "spelling has a lower correlation than any other study; reading is next; while the other four studies - arithmetic, geography, history,

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1. Hill, L. B., Rejall, A. E., and Thorndike, E. L., Practice in the Case of Typewriting, Pedagogical Seminary, Vol. XX, pp. 521, 524, 1913.
 2. Starch, Daniel, Correlations Among Abilities in School Studies, Journal of Educational Psychology, Vol. IV, p. 418, 1913.

and language, - have approximately the same high degree of correlation among themselves. The low correlation of spelling is very likely due to the fact that it is so largely dependent upon illogical, or pure unaided retentiveness, while the other studies are more dependent upon reasoning, logical memory, and divers associations." It is likely, therefore, that the low correlation of spelling with other subjects may be one of the causes for poor spelling with relation to typewriting.

One of the most interesting and significant psychological typewriting studies reviewed by the author was the one by Wells(1) (1916), who said that "there is perhaps no psychomotor process so directly open to experiment in which efficiency is of such wide practical value. Scientific inquiries into increasing the efficiency of typewriting on the psychological side may have a two-fold aim:

1. To discover the symptoms which presage success or failure in acquiring the accomplishment, in order that the probable progress of the learner may be predicted.

2. To study the various conditions of efficiency in typewriting as affected by different times of day and different work periods, and different techniques of operation, in order to increase so far as possible the efficiency of the skillful operator.

1. Wells, F. L., On the Psychomotor Mechanisms of Typewriting, American Journal of Psychology, Vol. XXVII, pp. 47, 56-7, 1916.

The real problem was that of studying psychomotor adaptations experimentally through the media of choice reactions." Wells defined "a false stroke as any stroke followed by a forward movement of the carriage which required correction in order to produce a perfect copy." He likewise defined "an error as a faulty psychomotor adjustment resulting in the occurrence of one or more false strokes." In his study he found "that the greatest number of errors involved only one false stroke; that is, they represented the striking of one wrong key, after which the writing proceeded correctly. Those involving two false strokes were nearly all transpositions. Errors of more than two false strokes, including many with excessive numbers of false strokes, were practically all misperceptions of the copy." Wells found that errors fall naturally into four kinds: omissions, substitutions, transpositions, and additions. He also found that typewriting was done better towards noon than at the beginning of the day. The Wells' study is particularly valuable to students of typewriting methods because of its more detailed treatment of the fundamental typewriting processes themselves, than was found in any of the other experiments reviewed for this study.

Numerous efforts have been made to develop actual prognostic tests in shorthand and typewriting. In 1917, Rogers(1) attempted to "test out in practice the method of

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1. Roger, Herbert W., Psychological Tests for Stenographers and Typewriters, Journal of Applied Psychology, Vol. I, pp. 266-72, 1917.

'empirical vocational tests' and to discover, if possible, tests for specific commercial functions which might have practical significance. The type of work selected for correlation with the test in this experiment was the work included under the term 'stenographic ability'. The three external factors in stenographic ability seem to be a knowledge of: (a) stenography, (b) typewriting, (c) grammar, spelling, punctuation." Ten tests which measured the speed of mental processes were used in the experiment, and also ten-minute writing, and dictation tests were used in typewriting. Practice tended to increase the correlation between the mental tests and the typewriting grades as was shown in the following figures: The average correlation for the nine psychological tests with the typewriting tests was "in October .253; in November .297; in December .266; in February .345. January was omitted because of distracting factors." Conclusion: that "'empirical tests' (1) give a far more reliable criterion for vocational guidance in the field of stenography than has ever been attained by any other method, and that they work out in practice."

In 1918-19, Kjerstad(2) studied the following factors: (a) practice, (b) individual differences, (c) changes in the kind of material, (d) changes in the length

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1. Rogers, Herbert W., Psychological Tests for Stenographers and Typewriters, Journal of Applied Psychology, Vol. I, pp. 263-72, 1917.
 2. Kjerstad, Vonrad L., The Form of the Learning Curves for Memory, Psychological Monographs, Vol. XXVI, No. 5, p.22 1918-19.

of material, (e) changes in the time of presentation, and, (f) certain momentary subjective features which he called warming-up and ennui but which may involve interest, attention, effort, and other factors. Kjerstad's conclusion will be stated in his own words.

First, "the most significant result from this whole study is in the invariable fact that where the three elements of the syllable, be it numbers or consonants, are of the same kind, the order in the cause of error from less to greater is always from first to last or from left to right. The human mind, be it from innate nature or from training or both, grasps and reproduces most easily the first or left hand element and with greatest difficulty the last or right hand element of a syllable or a number of three figures. This is in part contrary to the well known fact that in memorizing a group of syllables or other material the first and last parts are mastered before the parts in between. Our results thus tend to show that in the learning of nonsense syllables or numbers the law does not hold true for parts or elements of the individual syllable or number. Here the first part is learned first and the last part last as measured in terms of the number of errors."

The paragraph just quoted may be a cue to writers of texts, and to teachers of typewriting. The discovery of errors made in learning to typewrite by a large number of the school population of different ages might be a basis for improving the teaching methods. Accuracy and speed are

stressed as goals but many students have been left very largely, outside of textbook suggestions, to try to find the best ways to acquire them.

Second, that "the first consonant naturally receives the most emphasis when the subject tries to tie syllable to its preceding associate. Visually it is nearer to the associate syllable; auditorily, whether audibly pronounced or not, it with the vowel gives the sound to the syllable; and kinaesthetically it receives the emphasis in the pronunciation of the syllable whether the vocalization be actual or merely felt. Auditorily and kinaesthetically it is very probable that the last consonant receives much less emphasis than the first. These factors may be in part the cause of the relatively larger number of errors from the last consonant."(1)

Third, "that the kind of material to be learned has a marked influence upon the practice or learning curve, just as the kind of material seems to be the principal factor for variation of memory curves." Two general features observed in the curves were the initial rise and the gradual flattening of the curves toward the upper end. This finding is in harmony with present curves of progress in typewriting, so far as the author's observation and experience were concerned, in the work of her own students.

1. Kjerstad, Conrad L., The Form of the Learning Curves for Memory, Psychological Monographs, Vol. XXVI, No. 5, pp.73. 34-5.

An extensive study of the sequence of errors within the most used words for a large typewriting population would throw some light on the problem of learning to write on the typewriter with less waste of time. Lessenbery(1) reduced the Ayres Spelling Scale to the letter combination basis and then he made a study of errors found in several hundred speed tests which had been written by high school students.

Are there a large number of errors on the last consonant of words in typewritten material? Such information might be gleaned by studying many of the first copies written by large groups of typing students. One author has computed the huge waste of human energy, time, paper, and consequently, money by our present method of spelling. Perhaps there is an analogy in typewriting.

Book's(2) hypothesis that "motor control is innate and that it is very closely correlated with unusual success in acquiring typewriting speed," was borne out in his findings of a special investigation made of the students who participated in the 1923 International Contest in New York City.

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1. Lessenbery, D. D., Chart Showing All Letter Combinations Based on an Analysis of the Ayres One Thousand Most Frequently Used Words, L. C. Smith and Corona Typewriters, Inc., School Department, Syracuse, New York, 1926; Also "Error Chart".
 2. Book, W. F. Voluntary Motor Ability of the World's Champion Typists, Journal of Applied Psychology, Vol. VIII, p. 305, 1924.

Book(1) (1925) after years of study of psychology of skill, together with its application to the acquirement of speed in typewriting contests, came to the conclusion that, "in all these contests, the speedier the contestant, the more accurate and reliable is his record. That the elemental habits developed in learning to typewrite are best improved and fixed in and through their use as elements in the higher order habits. But in no sense can proficiency in the use of a higher order habit be substituted for the mastery of details." Book has gone further than any other psychologist at the present time to connect the acquirement of typewriting skill with psychological laws.

In Chapman's(2) study of "The Learning Curve in Typewriting", extending over a period of practice from 20 to 180 hours, it was shown that: "(a) There is no fundamental typical curve of improvement; (b) prolonged plateaus are notably absent, most of the subjects exhibit short plateaus which are probably genuine; (c) some subjects show positive acceleration in improvement in the period of 20 to 60 hours; (d) subjects vary greatly in their erratic variations from week to week; (e) that the composite curve of improvement shows a most abrupt change of direction at 90 hours."

In the teaching experience of the author, particu-

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1. Book, W. T., Learning to Typewrite, Gregg Publishing Co., Chicago, p. 233, 1925.
 2. Chapman, J. Crosby, The Learning Curve in Typewriting, Journal of Applied Psychology, Vol. III, p. 266, 1919.

larly with university students, this same factor was very noticeable, although the quarter instead of the semester was used as the division of time; but the relative effect was about the same. With high school students, during a former teaching experience, the fact was noticeable: that the degree of rise in the curve was less during the second semester than during the first, especially at the end of 180 hours of practice, or the first year of typewriting. The results of the Third Annual State Typewriting Contest held on May 7, 1927, would bear out Chapman's findings with regard to flattened curves of learning, at least of typewriting progress during the second year.

Another significant study in the typewriting field was that of Muscio,(1) assisted by Sowton, who gave a report to the Industrial Fatigue Research Board in London (1922-23), on the subject of "Vocational Tests and Typewriting." These men found that the immediate memory span (sentences), the spelling, and the direction tests, yielded average positive coefficients, and by means of experimental investigation showed that the capacities tested were used in typewriting.

Theoretical analysis of the technique of operating a typewriter, and correlation investigations, suggested "that the following five tests might be useful for vocational

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1. Muscio, B., and Sowton, A. C. M., Vocational Tests and Typewriting, British Journal of Psychology, Vol. XIII, p. 364, 1922.

guidance in typewriting: (a) immediate memory span (sentences): (b) directions; (c) finding; (d) completion, and, (e) spelling (this last test being a test of acquired ability). It is not unlikely also that a test of 'speed of association' would also be valuable, as this is suggested by theoretical analysis and is in agreement with the results obtained by Rogers. For typists of the 'assistant secretary' class, special emphasis would be laid upon intelligence tests."(1)

These men came to the conclusion that "no reliance could be placed upon a correlation coefficient between efficiency in a given test and efficiency in a particular occupation, when this coefficient has been obtained from only one industrial group (of ordinary size)(2) (and the measurement of efficiency is known to be as unreliable as it really is).

Such studies as the one made by Charters(3) and Whitley, (1924) on the "Analysis of Secretarial Duties and Traits," indicate the tendency of the times to emphasize job analysis. The report of an investigation by Nichols(4) (1927)

1. Ibid., pp. 368-9.

2. Idem.

3. Charters, W. W., and Whitley, J. B., Analysis of Secretarial Duties and Traits, Williams and Wilkins Co., Baltimore, pp. 75-126, 1924.

4. Nichols, F. G., A New Conception of Office Practice, Harvard Bulletin in Education, No. 12, p. 71, 1927.

shows that a scientific approach is being made to clerical work, and "that the relative importance of clerical duties on a frequency basis, places typing as third on the list."

There was a time when people tried to control their environment or to determine their personal qualifications by magic and oracles, but now a scientific approach is attempted. Tuttle(1) (1923) in his experiment in beginning typewriting found by the coefficient of correlation method that the sense of rhythm and ability to follow directions were of little importance in indicating ability to learn typewriting. This finding is contrary to the belief of most typewriting teachers.

While Muscio and Sowton(2) did not find any correlation between substitution tests and typewriting success, Gronert(3) found, in her study of pupils in the Cleveland High School, St. Louis, "that 87 per cent of those who failed in typewriting made a score below 50 in the substitution test, and that 100 per cent of the best grades went to those who scored above 50 in the prognostic test. The percentage of F's was more than six times as great in the group below as in that above, while the high grades were 13 or more times as frequent in the group above 50."

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1. Tuttle, W. W., The Determination of Ability for Learning Typewriting, Journal of Educational Psychology, Vol. XIV, p. 179-80, 1923.
 2. Op. cit.
 3. Gronert, Mary Lynch, A Prognostic Test in Typewriting, Journal of Educational Psychology, Vol. XVI, pp. 184-5, 1925.

An investigation which showed digression from most of the studies on the acquisition of skill in typewriting was the recent one made by Barton(1) (1926) wherein he experimented with "the size and the nature of the unit to use as exercise material;" that is, whether to begin with the usual nonsense combinations, or to correlate the teaching of typewriting more with that of teaching reading, by writing comprehensive units of words, phrases, sentences, and paragraphs from the start. His conclusion was in favor of the comprehensive units.

SUMMARY OF CHAPTER III

The typewriter, like the telephone and the automobile, has revolutionized another phase of communication, that of correspondence, and in addition the typewriter has paved the way for woman's entrance into the business and professional world. With the coming of the typewriter and the economic revolution known as "business organization", the demand for commercial workers arose, hence commercial departments now exist in private schools, secondary schools, colleges and universities in most of the civilized countries of the world. Out of this demand for commercial workers has arisen a further need, that of scientific teaching of commercial subjects. The typewriter and kindred machines require

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1. Barton, J. W., Comprehensive Units in Learning Typewriting, Psychological Monographs, Vol. XXXV, pp. 8-40, 1926.

in their operation not only mental, but motor control. The latter has been the basis of the many psychological investigations involving measurement during recent years. The present study, involving typing done by high school and university students, is an attempt to ascertain the relationship between accuracy in typewriting and the Ayres Spelling Scale of the One Thousand Most Common Words by means of computation and the application of the statistical method.

CHAPTER IV. A COMPARISON OF TYPEWRITING ERRORS MADE BY FIRST AND SECOND YEAR HIGH SCHOOL STUDENTS

The papers studied in this chapter were written by seventy-nine first year, and eighty-four second-year high school students who participated in the Third Annual Washington State Typewriting Contest on May 7, 1927, at the University of Washington.

According to the rules for participation in the state contest, first-year, or Class I, high school students most not have had any training in typewriting before the September previous to the contest, while second-year, or Class II, contestants in typewriting had had training previous to the September preceding the annual contest. District contests were held in many sections of the state for elimination purposes, consequently the high school contestants who participated in the contest were a highly selected group.

The contest was sanctioned by Mr. J. N. Kimball, International Contest Manager, who also furnished the contest copy, "His First Case," and to whom the papers of the

contestants were later sent to be kept on file for one year. The papers were marked according to the 1926 International Typewriting Contest Rules by the official checkers (commercial teachers in training at the University of Washington), who read all papers having a net speed of 50 or more words per minute in Class II, and 30 or more words per minute in Class I.

The preliminary marking of the contest papers was done by the contestants immediately following the contest, with no student having a chance to know who was marking his or her paper. In the final marking of the papers, those with a net below 50 and 30 respectively on the preliminary marking, were not rechecked unless some contest team was involved, otherwise the total number of errors used in this study would have been amplified somewhat. However this lack of amplification of errors was offset somewhat by assuming that all the contestants wrote through the contest once, or once only in the fifteen minutes. Due to an oversight in listing the errors from the contestants' papers several papers were not included in the final list of errors. Only spelling errors were used in this study.

After collecting the list of errors the next step was to check them against the Ayres Spelling Scale of the One Thousand Most Common Words, disregarding for this investigation the errors on words not in the Ayres Spelling Scale. In order to find the gain in accuracy by second-year students the following procedure was used:

1. The words contained in the Ayres Spelling Scale of One Thousand Most Common Words were listed.

2. The frequency of occurrence of words in the Ayres Spelling Scale in the contest copy was noted.

3. The total frequency for each word in the Ayres Spelling Scale in the entire contest copy for seventy-nine first-year students in typewriting was computed.

4. The total number of errors made by seventy-nine first-year students on each word in the Ayres Spelling Scale was counted.

5. The percentage of errors made by first-year students was computed by dividing the total frequency of occurrence of a word in the Ayres Spelling Scale by the total number of errors on the word in question.

6. The total frequency of each word in the Ayres Spelling Scale in the entire contest copy for eighty-four second-year students was computed.

7. The total number of errors made by eighty-four second-year students on each word in the Ayres Spelling Scale was counted.

8. The percentage of errors made by the second-year students on each word in the Ayres Spelling Scale was computed. (See No. 5 for method.)

9. The gain in accuracy by second-year students of typewriting was ascertained.

The complete results of the processes enumerated above appear in Appendix III.

There seemed to be little or no gain in accuracy by second-year students as is shown by the actual count of errors in Appendix III.

In Table I, the results may surprise the reader as they did the author. For instance in Table I, column 3, the cumulative result of errors for the first five words in the Ayres Spelling Scale shows a total number of errors of 149, and an average error count of 1.88 per student in the first-year group. In the second-year group the number of errors increased to 165 with an average of 1.96 per student. There was no gain accuracy on the first five words contained in the Ayres Spelling Scale by the second-year students and the same condition prevailed for the first twenty-five words. There was some gain in accuracy by second-year students on the first 250 words but none on the first 50 in the Ayres Spelling Scale.

According to the International Typewriting Contest Rules,(1) the penalty or loss would be 81.1 words, or 5.4 words per minute net speed on the first 100 words for each second-year student, using column 8 in Table I. For first-year students the average loss would be 82.6 words or 5.5 words per minute net speed on the first 100 words in the Ayres Spelling Scale.

For the first 250 words in the Ayres Spelling Scale

1. See Appendix I.

TABLE I. DATA ON FREQUENCY OF ERRORS MADE BY 79 FIRST-YEAR
AND 84 SECOND-YEAR HIGH SCHOOL STUDENTS ON WORDS CONTAIN-
ED IN THE AYRES SPELLING SCALE OF THE ONE THOUSAND MOST
USED WORDS AND FOUND IN THE FIFTEEN-MINUTE CONTEST COPY

	1	2	3	4	5	6	7	8	9
Cumulative totals of words									
Number of words actually found in contest copy									
Total number of errors made by 79 students									
Average number of errors per student made by 79 students									
Amplified average of number of errors per first-year student									
Total number of errors made by 84 students									
Average number of errors per student made by 84 students									
Amplified average of number of errors per second-year student(1)									
									Average decrease in number of errors made by second-year students
									Actual - Amplified
1st									
5	5	149	1.88	1.88	165	1.96	1.96	-.08	-.08
10	10	201	2.55	2.55	235	2.80	2.80	-.25	-.25
25	23	292	3.69	4.00	326	3.89	4.21	-.20	-.21
50	47	438	5.54	5.89	453	5.39	5.73	0.15	0.16
100	84	549	6.94	8.26	573	6.82	8.11	0.12	0.15
150	109	611	7.73	10.59	617	7.34	10.05	0.39	0.54
200	133	669	8.46	12.62	689	8.20	12.25	0.26	0.37
250	150	727	9.23	15.38	746	8.88	14.80	0.35	0.58

1. Not all of the words in the Ayres Spelling Scale were found in the fifteen-minute contest copy so the average number of errors was amplified on the assumption that the same number of errors would have been found on the "Ayres Words" not in the copy had they been in the copy. Either columns 4 and 7 or 5 and 8 may be used for the comparison.

the loss, according to the International Typewriting Contest Rules, using column 5, would be 153.8 words, or an average loss of 10.3 net speed per minute for each student. While for second-year students the loss would be 148 words or an average of 9.8 words per minute net speed per student. The gain in accuracy by the second-year student is .5 words per minute net speed per student.

According to the mimeographed Table of Results for the Third Annual Washington State Typewriting Contest,(1) the total number of errors for the second-year students was 2,164, and the average number of errors made by the second-year students was 25.5; while for first-year students the total number of errors was 2,328 with an average of 28 errors per student.

An interesting fact is that out of a total of 2,164 errors by the 84 second-year students, 573 were made on the first 150 words, and 746 on the first 250 words in the Ayres Spelling Scale. Out of a total of 2,328 errors by the first-year students, 611 were made on the first 150 words, and 727 on the first 250 words in the Ayres Spelling Scale, using actual error counts as given in Table I.

This conclusion is all the more significant when the fact is made known that the errors disregarded were not all word errors which had to be counted according to the Interna-

1. Hamack, F. H., Results of the Third Annual Washington State Typewriting Contest, mimeographed bulletin, College of Business Administration, University of Washington, pp.1-3, 1927.

tional Typewriting Contest Rules(1). in the total error count.

In Table II it is shown, that out of 1,052 errors made by 79 first-year high school students on the words in the Ayres Spelling Scale of the One Thousand Most Common Words, 438 occurred on the first 50 words in the Ayres Spelling Scale, 729 on the first 250 words, 901 on the first 500 words, 1,000 on the first 750 words, and only 52 additional errors were made on the last 250 words in the Ayres Spelling Scale.

Out of 1,018 errors made by 84 second-year high school students on the words in the Ayres Spelling Scale of the One Thousand Most Common Words, 453 occurred on the first 50 words in the Ayres Spelling Scale, 746 on the first 250 words, 877 on the first 500 words, 970 on the first 750 words, and only 48 on the last 250 words in the Ayres Spelling Scale. The second-year students made 34 less errors than the first-year students on the words in the Ayres Spelling Scale of the One Thousand Most Common Words.

It is true that the words in the latter half of the Ayres Spelling Scale did not occur in the contest copy as often as those in the first part of the Ayres Spelling Scale.

When the loss of efficiency, due to erasures made necessary by incorrect spelling on the typewriter, is taken into consideration, the magnitude of the need of proficiency in spelling becomes apparent.

1. See Appendix I.

TABLE II. CUMULATIVE FREQUENCY OF TYPEWRITING ERRORS MADE BY
79 FIRST-YEAR AND 84 SECOND-YEAR HIGH SCHOOL TYPEWRITING
STUDENTS IN RELATION TO THE AYRES SPELLING SCALE OF THE
ONE THOUSAND MOST COMMON WORDS

	First-Year Students		Second-Year Students	
	Cumulative total of errors for each 50 words in the Ayres Spelling Scale	Actual Number of errors made in each 50 words in the Ayres Spelling Scale	Cumulative total of errors for each 50 words in the Ayres Spelling Scale	Actual number of errors made in each 50 words in the Ayres Spelling Scale
Ayres Spelling Scale				
50	438	438	453	453
100	549	111	573	120
150	611	62	617	44
200	669	58	689	72
250	729	60	746	57
300	775	46	787	41
350	807	32	802	15
400	845	38	834	32
450	877	32	867	33
500	901	24	877	10
550	931	30	905	28
600	942	11	915	10
650	963	21	936	21
700	972	9	947	11
750	1000	28	970	23
800	1014	14	981	11
850	1025	11	1001	20
900	1042	17	1015	14
950	1047	5	1017	2
1000	1052	5	1018	1

The opinion prevails that second-year students can afford to write fast because the increased speed will more than offset the additional loss by errors.

The findings of this study would indicate that the economic law of "diminishing returns" operates; and that each increment of speed brings less and less total net gain to the student, because of the more or less constant factor of errors on common words which in the end make up the greater portion of all written matter.

CHAPTER V. TYPEWRITING ERRORS MADE BY UNIVERSITY STUDENTS

The inspiration for the investigation of typewriting errors came to the author several years ago while she was teaching in a large Middle Western high school, and the opportunity came to make the anticipated study while teaching typewriting in a Western university.

Approximately 3,000 typewritten pages, covering the efforts of forty-seven university students, for a period of eight weeks, were used in the investigation discussed in this chapter.

The collection of errors, involving as it did a tremendous amount of work both on the part of the students and the instructor, was consummated by issuing to each student a weekly summary sheet on which were listed words as written wrongly followed by a correct copy of each word so written during the week on the assignments done previously during the class hour. The assignments included the lessons from one to eighteen in the "New Rational Typewriting" text, 1923 edition, (1) and a daily speed test varying in length from one to fif-

1. SoRelle, R. P., The New Rational Typewriting, Gregg Publishing Co., Chicago, pp. 1-56, 1923.

teen minutes during the last half of the quarter. Students were timed on parts of the assignments very early in the quarter. International Typewriting Contest Rules(1) were used in checking the speed tests, but only the errors occurring in relation to words were used in this investigation.

After the errors were collected then they were checked against the Ayres Spelling Scale of the One Thousand Most Common Words, and those not found in the list were abandoned so far as this study was concerned.

The "coefficient of typewriting difficulty" is a new term as far as the author knows, originated by the needs of this investigation. The word with the highest number of errors was given a rank of one. In the same way the words in the Ayres Spelling Scale were ranked, beginning with one for the most used word. The coefficient of typewriting difficulty was derived by computing the relation between the rank on use, and the rank on errors: that is, a rank of 675 on use divided by a rank of 100 on errors equals coefficient of typewriting difficulty of 6.75.

The computation of the coefficients of typewriting difficulty given in Table XI, Appendix IV, for each work in the Ayres Spelling Scale on which three or more errors occurred, was accomplished by means of the steps indicated below:

-
1. See Appendix I.

1. The words in the Ayres Spelling Scale were listed in order of use.
2. The frequency of occurrence of each word in the Ayres Spelling Scale per 100,000 running words(1) was listed.
3. The frequency of typewriting errors made by forty-seven university students in beginning typewriting during a period of eight weeks was noted.
4. The words on the basis of frequency of errors were ranked according to the statistical method, giving the word with the highest number of errors the rank of one.
5. The words in the Ayres Spelling Scale, on a basis of frequency of use were ranked according to the statistical method, giving the word with the highest frequency of use the rank of one.
6. The coefficients of typewriting difficulty were computed by finding the relation between the rank in the Ayres Spelling Scale and the rank in errors: that is, divide the rank in Column E by the rank in Column D. (See Table XI, Appendix IV.)

The coefficient of difficulty for words with an error count of two or less was not computed because it was assumed that the true difficulty of these words, while low, was not known because of the low frequency of error. Had an accurate count been made of all the words in the copy written

1. Ayres, Leonard P., A Measuring Scale for Ability in Spelling, Russell Sage Foundation, New York, pp. 12-20, 1915.

by the university students according to the Ayres Spelling Scale, as was done for the high school students in the fifteen-minute contest, then no coefficients of typewriting difficulty would have been omitted.

A wide range of coefficients of typewriting difficulty was found, ranging from 0 to 9.99 for the word "effort." There does not appear to be a close relationship between the rank of the word in the Ayres Spelling Scale and the coefficient of typewriting difficulty. For instance, the word "which" has a rank of 30 on use in the Ayres Spelling Scale, and a rank of 6 in errors, thus it has a coefficient of typewriting difficulty of 5.00. While the word "the" has a rank of 1 in errors and in use, and a coefficient of typewriting difficulty of 1.

Approximately 170 words had a typewriting difficulty of 0: that is, no errors were made on them. However, it is not known whether this condition was due to the lack of a single occurrence, or to the low frequency of occurrence in the copy, or to a low coefficient of typewriting difficulty; since the copy was not compared with the Ayres Spelling Scale, but the frequency use per 100,000 running words according to the Ayres Spelling Scale(1) was used instead. More extended investigations would clear up these

1. Ayres, Leonard P., "A Measuring Scale for Ability in Spelling," Russell Sage Foundation, New York, pp. 12-20, 1915.

questions in all probability. A contemporary student(1) in the typewriting field is making a study of the vocabulary needs of typists according to business demands.

Words with a high rank in errors, and a high rank in frequency of use, would ordinarily have a low coefficient of typewriting difficulty, while words with a low rank in errors (meaning many errors) and a high rank in frequency of use would have a high coefficient of typewriting difficulty, and vice versa. For instance, the word "and" has an error rank of 3.5, a rank in use of 2, and a coefficient of typewriting difficulty of .57. The word "turn" has an error rank of 44.5 and a rank in use of 419, which caused it to have a very high coefficient of typewriting difficulty of $\frac{419}{44.5}$ or 9.40. The word "a" has a rank in use of 6, and an error rank of 167, consequently $\frac{6}{167}$ equals .036, or a low coefficient of typewriting difficulty. (See Table XI, Appendix IV, p.)

In 1922, Hoke(2) came to the conclusion, "that accuracy or inaccuracy is the result of frequent or infrequent use of the letter." While data in the present investigation of the author indicate that a high relative percentage of errors occurs on the most frequent words, and particularly on the first 150 words in the Ayres Spelling Scale of the One Thousand Most Common Words.

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1. Moran, W. A. Master's Thesis, University of Wisconsin (In progress), 1927.
 2. Hoke, R. E., The Improvement of Speed and Accuracy in Typewriting, John Hopkins University studies in Education, No. 7, Baltimore, p. 23, 1922.

Table III, a distribution of coefficients of typewriting difficulty for words contained in the Ayres Spelling Scale of the One Thousand Most Common Words, shows that only 240 different words in the first 600 words in the Ayres Spelling Scale have a coefficient of typewriting difficulty of less than 1, while 375 words in the entire Ayres Spelling Scale have a coefficient of typewriting difficulty of more than 1. The coefficients of typewriting difficulty for the remaining 385 words, having a frequency of error of less than 3, were not computed on the assumption of inadequate data being available.

There appears to be a close relationship between the errors made by the first and second-year students of typewriting in the high schools of the State of Washington, and by the beginning typewriting students at the University of Washington, who had class ranks varying from first-year to graduate students.

The significant result of the investigation of typewriting errors of university students is: that out of a total frequency of 9,414 errors, the author discovered that 2,680 were made on the first 50 words in the Ayres Spelling Scale. on the One Thousand Most Common Words; 4,085 errors were made on the first 100 words of the Ayres Spelling Scale; 5,960, or almost two-thirds, were made on the first 250 words in the Ayres Spelling Scale; 7,586 errors were made on the first 500 words in the Ayres Spelling Scale; 8,724 errors were made on

TABLE III. A DISTRIBUTION OF COEFFICIENTS OF TYPEWRITING DIFFICULTY FOR WORDS CONTAINED IN THE AYRES SPELLING SCALE OF THE ONE THOUSAND MOST COMMON WORDS WITH RELATION TO ERRORS MADE ON THEM BY 47 UNIVERSITY STUDENTS IN BEGINNING TYPEWRITING

Cumulative Totals of Ayres Words	Coefficients of Difficulty														
	01	50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	7.00	8.00	9.00
Zeros Ones Twos	.49	.99	1.49	1.99	2.49	2.99	3.49	3.99	4.49	4.99	5.99	6.99	7.99	8.99	9.99
TOTALS	167	118	100	61	179	118	117	48	42	14	10	6	5	8	2

(The balance of this data may be found in the original Thesis at the University of Washington.)

the first 750 words in the Ayres Spelling Scale, and that only 690 errors were made on the last 250 words in the Ayres Spelling Scale, according to Table IV.

In order to show the relation between easy words to spell in longhand and the frequency of errors made on them in typewriting, Table V, a distribution of typewriting errors according to frequency and rank, has been compiled.

Table V. shows the distribution of errors made by forty-seven university students in beginning typewriting on the words contained in the Ayres Spelling Scale of the One Thousand Most Common Words. This distribution of errors has been limited to those words on which nine or more errors occurred.

From this data it appears that errors in typewriting, for the most part, are due to actual transcribing difficulty on the typewritier, to over-confidence of the student on easy words, and to limited occurrence of unusual words.

TABLE IV. CUMULATIVE FREQUENCY OF TYPEWRITING ERRORS MADE BY
47 UNIVERSITY STUDENTS IN BEGINNING TYPEWRITING FOR
A PERIOD OF EIGHT WEEKS WITH RELATION TO THE AYRES
SPELLING SCALE OF THE ONE THOUSAND MOST COMMON WORDS

Ayres Spelling Scale	U n i v e r s i t y	S t u d e n t s
	Actual Number of Errors Made in Each 50 Words in the Ayres Spelling Scale	Cumulative Total of Errors for Each 50 Words in the Ayres Spelling Scale
50	2680	2680
100	1405	4085
150	844	4929
200	609	5538
250	422	5960
300	421	6381
350	324	6705
400	321	7026
450	302	7328
500	258	7586
550	301	7887
600	218	8105
650	204	8309
700	219	8528
750	196	8724
800	150	8874
850	112	8986
900	186	9172
950	112	9284
1000	130	9414

TABLE V. A DISTRIBUTION OF FREQUENCY AND RANK OF TYPEWRITING ERRORS MADE BY 47 UNIVERSITY STUDENTS IN BEGINNING TYPEWRITING ON A LIMITED NUMBER OF WORDS IN THE AYRES SPELLING SCALE OF THE ONE THOUSAND MOST COMMON WORDS

Ayres Spelling Scale	Number Errors	Rank
the	298	1.
to	157	2.
and	129	3.5
of	129	3.5
is	102	5.
which	98	6.
it	96	7.
that	83	8.
for	71	10.5
with	71	10.5
when	71	10.5
have	71	10.5
be	69	13.
would	66	14.5
will	66	14.5
work	60	16.
you	58	17.
but	57	18.
in	55	19.5
thank	55	19.5
are	53	21.5
this	53	21.5
was	50	23.
their	48	24.
time	47	26.
good	47	26.
do	47	26.
there	46	28.5
write	46	28.5
your	45	32.
we	45	32.
my	45	32.
they	45	32.
never	45	32.
very	44	35.5
what	44	35.5
his	42	37.5

Ayres Spelling Scale	Number Errors	Rank
been	42	37.5
he	40	40.
then	40	40.
Thing	40	40.
has	39	42.5
like	39	42.5
as	38	44.5
turn	38	44.5
think	37	46.5
those	37	46.5
some	36	49.
can	36	49.
more	36	49.
could	35	52.5
should	35	52.5
must	35	52.5
great	35	52.5
effort	34	55.
if	33	57.
take	33	57.
than	33	57.
not	31	62.
one	31	62.
then	31	62.
only	31	62.
well	31	62.
give	31	62.
every	31	62.
about	30	67.
these	30	67.
done	30	67.
say	29	70.
ever	29	70.
word	29	70.
other	28	74.
away	28	74.
people	28	74.
begin	28	74.
began	28	74.
from	27	78.5
up	27	78.5
over	27	78.5
Day	27	78.5
by	26	82.5
our	26	82.5
find	26	82.5
Look	26	82.5
so	25	87.5
two	25	87.5

Ayres Spelling Scale	Number Errors	Rank
year	25	87.5
many	25	87.5
because	25	87.5
doubt	25	87.5
I	24	95.5
had	24	95.5
said	24	95.5
most	24	95.5
also	24	95.5
while	24	95.5
same	24	95.5
eight	24	95.5
heart	24	95.5
told	24	95.5
even	23	103.
made	23	103.
business	23	103.
large	23	103.
world	23	103
on	22	110.5
were	22	110.5
any	22	110.5
out	22	110.5
may	22	110.5
after	22	110.5
know	22	110.5
number	22	110.5
return	22	110.5
long	22	110.5
all	21	120.5
or	21	120.5
him	21	120.5
who	21	120.5
place	21	120.5
found	21	120.5
speak	21	120.5
third	21	120.5
effect	21	120.5
experience	21	120.5
high	20	127.5
hurt	20	127.5
before	20	127.5
close	20	127.5
make	19	136.5
here	19	136.5
night	19	136.5
man	19	136.5
big	19	136.5
ten	19	136.5

Ayres Spelling Scale	Number Errors	Rank
does	19	136.5
upon	19	136.5
least	19	136.5
become	19	136.5
beside	19	136.5
entire	19	136.5
power	19	136.5
into	19	136.5
next	18	147.5
glad	18	147.5
down	18	147.5
life	18	147.5
small	18	147.5
water	18	147.5
necessary	18	147.5
organize	18	147.5
house	17	155.5
best	17	155.5
ground	17	155.5
reply	17	155.5
person	17	155.5
list	17	155.5
themselves	17	155.5
chief	17	155.5
a	16	167.
letter	16	167.
just	16	167.
love	16	167.
old	16	167.
first	16	167.
where	16	167.
once	16	167.
since	16	167.
might	16	167.
among	16	167.
country	16	167.
duty	16	167.
extra	16	167.
get	16	167.
dear	15	183.
truly	15	183.
its	15	183.
last	15	183.
way	15	183.
school	15	183.
wish	15	183.
little	15	183.
another	15	183.
nothing	15	183.
thought	15	183.

Ayres Spelling Scale	Number Errors	Rank
nine	15	183.
hand	15	183.
February	15	183.
ride	15	183.
success	15	183.
perfect	15	183.
no	14	200.
shall	14	200.
such	14	200.
put	14	200.
help	14	200.
believe	14	200.
back	14	200.
live	14	200.
quite	14	200.
half	14	200.
went	14	200.
neither	14	200.
sometimes	14	200.
river	14	200.
try	14	200.
behind	14	200.
beg	14	200.
want	13	215.5
how	13	215.5
street	13	215.5
cannot	13	215.5
thorough	13	215.5
always	13	215.5
act	13	215.5
remember	13	215.5
whole	13	215.5
question	13	215.5
often	13	215.5
public	13	215.5
divide	13	215.5
check	13	215.5
at	12	230.
week	12	230.
yet	12	230.
fine	12	230.
start	12	230.
run	12	230.
however	12	230.
early	12	230.
end	12	230.
body	12	230.
felt	12	230.
buy	12	230.

Ayres Spelling Scale	Number Errors	Rank
across	12	230.
burn	12	230.
flight	12	230.
an	11	251.5
feel	11	251.5
three	11	251.5
much	11	251.5
own	11	251.5
conose	11	251.5
anything	11	251.5
child	11	251.5
under	11	251.5
board	11	251.5
fan	11	251.5
without	11	251.5
madam	11	251.5
member	11	251.5
certain	11	251.5
heard	11	251.5
name	11	251.5
true	11	251.5
nor	11	251.5
dark	11	251.5
refer	11	251.5
subject	11	251.5
wait	11	251.5
education	11	251.5
dozen	11	251.5
begun	11	251.5
debate	11	251.5
important	11	251.5
go	10	276.
sure	10	276.
kind	10	276.
order	10	276.
few	10	276.
again	10	276.
talk	10	276.
right	10	276.
knew	10	276.
during	10	276.
seven	10	276.
woman	10	276.
past	10	276.
learn	10	276.
form	10	276.
stand	10	276.
supply	10	276.
worth	10	276.

Ayres Spelling Scale	Number Errors	Rank
judgment	10	276.
trouble	10	276.
judge	10	276.
now	9	300.5
hope	9	300.5
until	9	300.5
come	9	300.5
afternoon	9	300.5
soon	9	300.5
call	9	300.5
enough	9	300.5
cent	9	300.5
friend	9	300.5
book	9	300.5
follow	9	300.5
spend	9	300.5
bring	9	300.5
November	9	300.5
happy	9	300.5
nearly	9	300.5
character	9	300.5
himself	9	300.5
cover	9	300.5
difference	9	300.5
light	9	300.5
game	9	300.5
account	9	300.5
event	9	300.5
combination	9	300.5
human	9	300.5
progress	9	300.5
beginning	9	300.5

CHAPTER VI. A COMPARISON OF TYPEWRITING AND SPELLING DIFFICULTIES

A comparison of typewriting and spelling difficulties for 375 words contained in the Ayres Spelling Scale of the One Thousand Most Common Words is believed to be representative for the whole investigation. Table IX of this study shows that approximately half of the 375 words on which errors were made are one-syllabled words.

The survey of the errors(1)(2) made by 166 representative high school students in the Third Annual Washington State Typewriting Contest held on May 7, 1927, and by forty-seven regularly matriculated students at the University of Washington in 1927, indicates that the larger proportion of the typewriting errors were made on the first one-fourth to one-half of the words contained in the Ayres Spelling Scale of the One Thousand Most Common Words. Approximately 3,000 pages of typewritten material was studied. It is true that

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1. See Appendix III, p. 106 (H.S.)
 2. See Appendix IV, p. 145. (Univ.)

all of the words in the Ayres Spelling Scale did not appear in the fifteen-minute contest copy used by the high school students. However, it is probable that most of the words in the Ayres Spelling Scale did occur either in the textbook copy or in the standard typewriting tests which were used by the forty-seven university students during the quarter.

Table VIII, A Comparative Study of Coefficients of Typewriting Difficulty, Typewriting Errors, Rank on Use, and Spelling Difficulty of Three Hundred Seventy-five Words contained in the Ayres Spelling Scale of the One Thousand Most Common Words, was derived by means of the steps indicated below:

1. The words were listed according to the numerical status of the coefficients of typewriting difficulty, e.g., the word "effort" has a coefficient of typewriting difficulty of 9.99, thus it was placed first on the list of coefficients of typewriting difficulty.

2. The coefficients of typewriting difficulty were ranked by giving the rank of 1 to the word having the highest coefficient of typewriting difficulty.

3. The number and rank of errors were indicated.

4. The rank on use was indicated.

5. The spelling difficulty was ascertained by us-

ing the Ayres' formula(1) from which Tables VI and VII were derived. Tables VI and VII show the spelling difficulties and spelling norms for the words in the Ayres Spelling Scale of the One Thousand Most Common Words for grades two to eight inclusive. The author of this investigation does not know what the true relation should be for spelling norms of grade school, high school, and university students.

The highest frequency of errors on the words contained in the Ayres Spelling Scale was on those words of medium and low spelling difficulty. Table VIII shows that very few of the numbers indicating spelling difficulty were high. It appears from the data in this chapter that the high frequency of errors on such words as "the" does not come from inability of students to spell the word "the" away from the typewriter. Hence the hypothesis that spelling and typewriting difficulties are two different things appears to be true.

In Table VIII the words with high coefficients of typewriting difficulty for the most part appear to be words having a spelling difficulty ranging from 12 to 22 on the Ayres Measuring Scale.(2) It is to be noted that eighth grade pupils average 75 per cent of correct spelling on column 24.

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1. Ayres, Leonard P., A Measuring Scale for Ability in Spelling, Russell Sage Foundation, New York, pp. 12-20, 28, 43-50, 1915.
 2. Ayres, Leonard P., A Measuring Scale for Ability in Spelling, Russell Sage Foundation, New York, pp. 28, 43-56, 1915.

Since the students of this study were high school and college students, they could spell with ease, ordinarily, the words of columns as difficult as 22. While in the same table many of the words with a high frequency of errors have a low spelling difficulty, as indicated by the numbers in the last column of Table VIII. Thus it appears from the data that many typewriting errors are due to lack of fixation of habits of writing accurately on the typewriter, or to a possible undiscovered element of typewriting difficulty.

TABLE VI. KEY TO SPELLING DIFFICULTY ACCORDING TO AYRES SPELL-
ING SCALE (1)

Column A - 1*	Column J - 10	Column S - 19
Column B - 2	Column K - 11	Column T - 20
Column C - 3	Column L - 12	Column U - 21
Column D - 4	Column M - 13	Column V - 22
Column E - 5	Column N - 14	Column W - 23
Column F - 6	Column O - 15	Column X - 24
Column G - 7	Column P - 16	Column Y - 25
Column H - 8	Column Q - 17	Column Z - 26
Column I - 9	Column R - 18	

* In Ayres Spelling Scale the words are arranged in columns A, B, C, D, etc. Column A is the easiest; Column Z the most difficult. For this study the numbers listed above are used to designate the columns.

1. Ayres, Leonard P., Measuring Scale for Ability in Spelling, Russell Sage Foundation, New York, pp. 28-29, 1915.

TABLE VII. NORMS FOR SPELLING ABILITY AND SPELLING
DIFFICULTY FOR GRADES TWO TO EIGHT(1)(2)

Grade	Columns in Which Grades Average 50% of Correct Spelling	Columns in Which Grades Average 75% of Correct Spelling
Second	12	9
Third	15	12
Fourth	18	15
Fifth	20	17
Sixth	22	19
Seventh	24	21
Eighth	26	24

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1. Ibid.
 2. Monroe, W. S., DeVoss, J. C., and Kelly, F., Jr., Educational Tests and Measurements, Houghton Mifflin Co., Chicago, Pp. 217-19, 1924.

TABLE VIII. A COMPARATIVE STUDY OF COEFFICIENTS OF TYPEWRITING DIFFICULTY, TYPEWRITING ERRORS, RANK ON USE, AND SPELLING DIFFICULTY OF THREE HUNDRED SEVENTY-FIVE WORDS CONTAINED IN THE AYRES SPELLING SCALE OF THE ONE THOUSAND MOST COMMON WORDS.

Words	Coefficients of Typewriting Difficulty		Typewriting Errors		Rank on Use in Ayres Spelling Scale		Spell- ing Diffi- culty
	Coeffi- cient	Rank	Number	Rank			
1 effort	9.99	1	34	55.	548.5		17
2 turn	9.40	2	38	44.5	419.		12
3 doubt	7.74	3	25	87.5	676.5		19

(The balance of this data may be found in the original Thesis at the University of Washington. Pages 83 to 91.)

CHAPTER VII. TYPEWRITING DEMONS

As Jones (1) found "Spelling Demons", so the author of this study believes that a similar situation exists with relation to words misspelled on the typewriter. In fact, one of the main purposes of this investigation has been to discover the 150 words contained in the Ayres Spelling Scale of the One Thousand Most Common Words which have proved to be typewriting "demons" for 166 representative high school students in the State of Washington, and for forty-seven university students ranging in class rank from freshmen to graduate students at the University of Washington. Approximately 3,000 pages of typewritten material were studied.

In this investigation of typewriting errors a typewriting "demon" has been defined as follows: It is a word contained in the Ayres Spelling Scale of the One Thousand Most Common Words having a very high frequency of errors; or having a high coefficient of typewriting difficulty and

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1. Halliburton, M. W., Ferguson, A. C., Dvorak, August, The Standard Speller, Book Two, Southern Publishing Company, Dallas, Tex., p. 181, 1925.

a relatively high frequency of errors. Generally words having a high frequency of errors also have a high coefficient of typewriting difficulty, which shows that the errors are more frequent on such words than a pro-rated proportion according to use would indicate. This was found to be the case in all but a few of the 150 typewriting "demons." All but thirty-five of the selected "demons" have a coefficient of typewriting difficulty greater than 1.

The location of the word in the list of typewriting "demons" was determined by using the frequency of errors modified by the coefficient of typewriting difficulty for each word. That is: words were arranged in the order of the number of errors, except that one unit of coefficient of typewriting difficulty was arbitrarily considered as offsetting a frequency of two errors. The following examples will illustrate the method used: "Which" has a frequency of errors of 98 and "it" has a frequency of errors of 96. "Which" has a coefficient of typewriting difficulty of 5.00 and "it" has a coefficient of typewriting difficulty of 1.57. Therefore, "which" precedes "it" on both frequency of errors and coefficient of typewriting difficulty. "But" has a frequency of errors of 57, and a coefficient of typewriting difficulty of 1.44; and "thank" has a frequency of errors of 55, and a coefficient of typewriting difficulty of 4.50. The difference in coefficients of typewriting difficulty is 3.06 in favor of "thank." The difference in frequency of errors is 2 in favor of "but,"

therefore, "but" would precede "thank" if "thank" had a frequency of errors of 2 times 3.06 or 6 less than "but". However, "thank" has a frequency of errors of 2 less than "but", therefore "thank" precedes "but" on the list. For "but" to precede "thank", "but" should have 5 more errors than "thank" or a coefficient of typewriting difficulty of $2\frac{1}{2}$ more units.

In Table IX, Typewriting "Demons" are given, which, if adequately learned, the results of this study indicate, would greatly facilitate the acquisition of accuracy and speed in typewriting.

TABLE IX. TYPEWRITING DEMONS

Rank in De- mon List	Words Found in Ayres Spelling Scale	Error Number	Rank	Coefficient of Typewrit- ing Diffi- culty		Ayres Rank on Fre- quency of Use	Spell- ing Diffi- culty
				Number	Rank		
1	the	298	1.	1.	376.5	1	4
2	to	157	2.	2.	138.	4	8
3	is	102	5.	2.60	87.	13	3

(The balance of this data may be found in the original Thesis at the University of Washington.) (Pages 95 to 98.)

CHAPTER VIII. SUMMARY AND CONCLUSIONS

A summary of the conclusions reached in this investigation of errors made in typewriting is given in the following brief statements:

1. Typewriting originated out of a desire for printed records, as well as for faster methods of writing. The economic revolution in business organization increased the demand for typewriters and typewriting tremendously. And parallel with the above factor, the typewriter has been the means of changing social conditions for women--liberating them from the necessity of earning by the domestic economy of previous generations.

2. The development of typewriting as a subject of study in the curriculum has resulted from the increased demands for commercial workers all over the world, particularly in the United States.

3. The standardization of the methods of teaching typewriting and the discovery of exceptional students in the technique of operating typewriters have been the results of the International Typewriting Contests.

4. There was no gain in accuracy on the first 50 words of the Ayres list by the second-year high school students.

5. There was a slight gain in accuracy by second-year over first-year high school students on the first 250 words contained in the Ayres Spelling Scale of the One Thousand Most Common Words.

6. Out of a total of 2,164 errors made by 84 second-year students, 573 were made on the first 150 words, and 746 on the first 250 words in the Ayres Spelling Scale during the recent state typewriting contest. Out of 2,328 errors made by first-year students, 611 were made on the first 150 words, and 727 on the first 250 words in the Ayres Spelling Scale in the contest mentioned above.

7. From the data in this study there appears to be a marked similarity in the lists of words on which most errors were made by the typewriting students in high schools, and by first-quarter students of typewriting in the university. More than one-fourth of the errors made during an eight-week's period by university students on words in the Ayres Spelling Scale were on the first 50 words, and almost two-thirds of the 9,414 errors were on the first 250 words in the Ayres list.

8. The penalty of fifty strokes for each error, according to the International Typewriting Contest Rules, appears to work an uneven hardship because relatively fewer

strokes are added to the total number of strokes when the errors occur on the small words, than on long words. The penalty for each error is the same, regardless of the coefficient of typewriting difficulty of the word, frequency of the error, or the frequency of use of the words.

9. The words on which most errors occurred are the ones most frequently used, e.g., the word "the" has the highest frequency on use, according to the Ayres Spelling Scale, and highest frequency errors in this study.

10. Each increment of speed brings less and less total net gain to the student because of the more or less constant factor of errors on the common words which, in the end, make up the greater portion of all written matter.

11. Typewriting difficulty and spelling are not the same thing.

12. Many of the words with high coefficients of typewriting difficulty appear to be words having a spelling difficulty ranging from 12 to 22 on the Ayres Measuring Scale, i.e., average difficulty for seventh and eighth grades. Words with a high frequency of typewriting errors appear to have a low spelling difficulty, i.e., average difficulty for grades one to six.

13. Typewriting errors may be due to carelessness or over-confidence in typing the words of low spelling difficulty. This, however, is hardly justified by the facts that elaborate prizes were at stake in the state contest, and that

university students took the typewriting course without credit and paid an additional fee in order to take typewriting. Rather it seems poor habit formation in early stages of learning to typewrite.

Suggested Studies

1. The spelling ability away from the typewriter might be tested before the student starts to typewrite; likewise, the reading ability, and the motor adjustment ability.

2. Further investigation of typewriting errors with relation to persistence of typewriting, and of spelling difficulties might be made.

3. The failures in typewriting might be studied with relation to reading, and spelling abilities.

4. Students might be assigned the typewriter to correct poor spelling, as is sometimes done in printing as a remedial measure for poor spelling in English composition.

5. The justification of the second year of typewriting in the high schools might be a subject broad enough for several studies.

APPENDIX I

APPENDIX I. INTERNATIONAL TYPEWRITING CONTEST RULES

(The balance of this data may be found in the original thesis at the University of Washington.)

APPENDIX II

APPENDIX II. QUESTIONNAIRE - TYPING

1. Name _____ (surname first)
2. Address: Local _____ Home address _____
3. Telephone number _____
4. College now registered in _____
5. Major _____ Minor _____ Year _____
(Fr., Soph., Etc.)
6. Hours registered for _____
7. Hours of work other than school:
 - a. Morning _____
 - b. Afternoon _____
 - c. Night _____
 - d. Saturday _____
 - e. Sunday _____
8. Why are you taking typing? _____
9. Previous training in typing:
 - a. Where taken _____
 - b. When _____
 - c. Instructor under whom taken (if remembered) _____
 - d. Work covered _____
 - e. At what hour of day taken _____
 - f. Age when taken _____
 - g. Machine used _____
 - h. Approximate accuracy acquired _____
 - i. Approximate speed acquired _____
 - j. Grade Received _____

10. Success in Typing:

- a. Was typing easy?_____Hard?_____
- b. If hard, reason why_____
- c. Do you read rapidly?_____Slow?_____
- d. On which side of the machine do you place copy?_____
- e. Describe most common errors made:_____

11. Physical condition:

- a. Eyes: Medium_____Near sighted_____Far sighted_____
- b. Hearing: Good_____Poor_____
- c. Shape of hands: Make a drawing of the hand beginning at the wrist and with the palm down on the reverse side of this sheet.
- d. Indicate any stiffness of finger joints or other irregularities that might interfere in typing_____
- e. Are you inclined to be nervous?_____
- f. Height_____ g. Weight_____
- h. Digestion: Good_____Poor_____
- i. Do you have headaches?_____
- j. Do you smoke?_____
- k. Do you eat three meals a day?_____ If not, which one do you omit?_____
- l. Do you get eight or more hours of sleep?_____
- m. Attendance: Regular_____Part-time_____Why?_____

APPENDIX III

TABLE X. FREQUENCY OF TYPEWRITING ERRORS AND PERCENTAGE OF GAIN IN ACCURACY MADE BY 79 FIRST YEAR, AND 84 SECOND YEAR HIGH SCHOOL STUDENTS IN THE THIRD ANNUAL WASHINGTON STATE TYPEWRITING CONTEST HELD ON MAY 7, 1927, AT THE UNIVERSITY OF WASHINGTON, WITH RELATION TO THE AYRES SPELLING SCALE OF THE THOUSAND MOST COMMON WORDS.

Ayres Spelling Scale	Frequency of Occurrence of Words in Ayres Spelling Scale	Total Frequency of Ayres Spelling Scale in Contest	Copy for 79 First Year Students	Total Number of Errors Made by 79 First Year Students	Percentage of Errors Made by 79 First Year Students	Total Frequency of Ayres Spelling Scale in Contest	Copy for 84 Second Year Students	Total Number of Errors Made by 84 Second Year Students	Percentage of Errors Made by 84 Second Year Students	Gain in Accuracy by Second Year Students
the	81	6399		38	.59	6804	59	86	-.27	
and	50	3950		36	.92	4200	39	.92	.00	
of	52	4108		22	.53	4368	22	.50	.03	
to	60	4740		26	.54	5040	27	.53	.01	
I	47	3713		27	.73	3948	18	.45	.38	
a	32	2528		13	.51	2688	11	.40	.11	
in	17	1343		11	.81	1428	14	.98	.17	
that	36	2844		19	.66	3024	30	.99	.33	
you	3	237		2	.84	252	1	.39	.45	
for	15	1185		7	.59	1260	14	1.11	.52	
it	26	2054		13	.63	2184	19	.86	.25	
was	23	1817		18	.99	.932	18	.93	.06	
is	17	1343		3	.22	1428	5	.35	.13	
will	--	----		--	----	----	--	----	----	
as	12	948		11	1.16	1008	11	1.09	.07	
have	3	237		7	2.95	252	1	.39	2.56	
not	14	1106		2	.18	1176	5	.42	.24	
with	10	790		4	.50	840	9	1.07	.57	
be	12	948		4	.42	1008	--	--	.42	
your	--	----		--	----	----	--	--	--	
at	6	474		9	1.89	504	2	.39	1.50	

we	3	237	2	.84	252	2	.79	.05
on	5	395	2	.50	420	3	.71	-.21
he	15	1185	10	.84	1260	11	.87	-.03
by	9	711	6	.84	756	5	.66	.18
but	10	790	9	1.14	840	5	.59	.55
my	12	948	22	2.12	1008	12	1.19	.93
this	3	237	4	1.68	252	8	3.17	-1.59
his	5	395	--	--	420	--	--	--
which	6	474	15	3.16	504	9	1.78	1.38
dear	--	----	--	--	----	--	--	--
from	4	316	6	1.89	336	4	1.19	.70
are	1	79	--	--	84	--	--	--
all	4	316	1	.31	336	1	.29	.02
me	10	790	6	.75	840	9	1.07	-.32
so	6	474	8	1.68	504	5	.99	.68
one	13	1027	16	1.55	1092	11	1.00	.55
if	5	395	5	1.26	420	5	1.19	.07
they	1	79	0	--	84	1	1.19	-1.19
had	15	1185	11	.92	1260	17	1.34	-.42
has	3	237	7	2.95	252	1	.39	2.56
very	1	79	1	1.26	84	1	1.19	.07
were	5	395	5	1.26	420	--	--	1.26
been	4	316	2	.63	336	1	.29	.34
would	11	869	16	1.84	924	16	1.73	.11
she	10	790	10	1.26	840	10	1.19	.07
or	7	553	1	.18	588	4	.68	-.50
there	4	316	1	.31	336	4	1.19	-.88
her	5	395	--	--	420	--	--	--

Continued:

an	3	237	--	--	252	3	1.19	-1.19
when	5	395	5	1.26	420	14	3.33	-2.07
time	2	158	4	2.53	168	4	2.39	.14
go	3	237	1	.42	252	3	1.19	-.77
some	3	237	8	1.68	252	3	1.19	.49
any	3	237	5	2.10	252	2	.79	1.31
can	--	--	--	--	--	--	--	--
what	3	237	5	2.10	252	3	1.19	.91
send	--	--	--	--	--	--	--	--
out	7	555	1	.18	588	2	.34	-.16
them	1	79	1	1.26	84	1	1.19	.07
him	4	316	8	2.53	336	4	1.19	1.34
more	3	237	2	.84	252	2	.79	.05
about	9	711	11	1.54	756	20	2.64	-1.10
no	5	395	4	1.01	420	9	2.14	-1.13
please	--	--	--	--	--	--	--	--
week	1	79	--	--	84	--	--	--
night	2	158	12	7.59	168	7	4.16	3.43
their	--	--	--	--	--	--	--	--
other	1	79	--	--	84	--	--	--
up	5	395	2	5.06	420	1	.23	4.83
our	2	158	--	--	168	--	--	--
good	2	158	3	1.89	168	5	2.98	-1.09
say	1	79	--	--	84	--	--	--
could	5	395	5	1.26	420	7	1.66	-.40
who	3	237	1	.42	252	2	.79	-.37

Continued:

said	2	158	4	2.55	168	1	.59	1.94
only	2	158	2	1.26	168	5	2.97	-1.71
well	3	237	3	1.26	252	2	.79	.47
am	1	79	-	---	84	-	---	---
these	-	---	-	---	---	-	---	---
tell	-	---	-	---	---	-	---	---
even	-	---	-	---	---	-	---	---
made	2	158	1	.63	168	2	1.19	-.56
know	-	---	-	---	---	-	---	---
year	-	---	-	---	---	-	---	---
before	-	---	-	---	---	-	---	---
long	-	---	-	---	---	-	---	---
sincerely	-	---	-	---	---	-	---	---
shall	-	---	-	---	---	-	---	---
sent	1	79	-	---	84	1	1.19	-1.19
us	1	79	5	6.32	84	-	---	6.32
give	2	158	3	1.89	168	3	1.78	.11
Mr.	-	---	-	---	---	-	---	---
like	-	---	-	---	---	-	---	---
enclose	-	---	-	---	---	-	---	---
next	-	---	-	---	---	-	---	---
want	-	---	-	---	---	-	---	---
hope	-	---	-	---	---	-	---	---
love	-	---	-	---	---	-	---	---
man	-	---	-	---	---	-	---	---
old	1	79	1	1.26	84	2	2.38	-1.12
every	-	---	-	---	---	-	---	---
find	2	158	-	---	---	-	---	---

Continued:

most	1	79	---	84	1	1.19	-1.19
such	1	79	---	84	2	2.38	-2.38
today	-	---	---	---	-	---	---
must	1	79	---	84	-	---	---
way	4	316	---	336	1	.29	.98
first	1	79	---	84	2	2.38	1.12
new	1	79	---	84	-	---	---
seem	-	---	---	---	-	---	---
morning	1	79	---	84	2	2.38	.15
school	3	237	---	252	10	3.96	2.36
great	1	79	---	84	1	1.19	-1.19
wish	-	---	---	---	-	---	---
home	1	79	---	84	-	---	---
feel	-	---	---	---	-	---	---
glad	-	---	---	---	-	---	---
never	-	---	---	---	-	---	---
three	1	79	---	---	-	---	---
much	4	316	---	84	2	2.38	-1.12
how	2	158	---	336	3	.89	1.32
until	1	79	---	168	3	1.78	3.81
many	-	---	---	84	1	1.19	-1.19
put	2	158	---	---	-	---	---
get	1	79	---	168	-	---	2.53
into	3	237	---	84	4	4.76	-2.23
let	-	---	---	252	6	2.38	-1.54
yesterday	-	---	---	---	-	---	---
come	2	158	---	168	1	.59	.59

Continued:

[illegible]

course	3	237	9	3.79	252	6	2.38	1.41
through	3	237	4	1.68	252	7	2.77	-1.09
call	-	---	-	---	---	-	---	---
meet	-	---	-	---	---	-	---	---
people	-	---	-	---	---	-	---	---
another	-	---	-	---	---	-	---	---
number	1	79	1	1.26	84	2	2.38	-1.12
place	-	---	-	---	---	-	---	---
Sunday	-	---	-	---	---	-	---	---
use	-	---	-	---	---	-	---	---
church	-	---	-	---	---	-	---	---
nice	-	---	-	---	---	-	---	---
sure	3	237	-	---	252	-	---	---
anything	-	---	-	---	---	-	---	---
hour	-	---	-	---	---	-	---	---
children	-	---	-	---	---	-	---	---
don't	-	---	-	---	---	-	---	---
four	2	158	4	2.56	168	5	2.97	-.44
kind	-	---	-	---	---	-	---	---
oblige	-	---	-	---	---	-	---	---
nothing	2	158	8	5.06	168	4	2.38	3.68
off	6	474	2	.42	504	4	.79	-.37
believe	1	79	1	1.26	84	1	1.19	.07
boy	-	---	-	---	---	-	---	---
city	-	---	-	---	---	-	---	---

found	3	237	11	4.63	252	2	.79	3.84
pay	2	158	2	1.28	168	3	1.78	-.52
tomorrow	-	---	-	---	---	-	---	---
doctor	-	---	-	---	---	-	---	---
five	-	---	-	---	---	-	---	---
o'clock	-	---	-	---	---	-	---	---
read	-	---	-	---	---	-	---	---
back	-	---	-	---	---	-	---	---
enough	-	---	-	---	---	-	---	---
fine	-	---	-	---	---	-	---	---
order	-	---	-	---	---	-	---	---
bed	-	---	-	---	---	-	---	---
cold	-	---	-	---	---	-	---	---
live	-	---	-	---	---	-	---	---
mail	-	---	-	---	---	-	---	---
few	3	237	-	---	252	2	.79	-.79
hear	-	---	-	---	---	-	---	---
child	-	---	-	---	---	-	---	---
mother	-	---	-	---	---	-	---	---
return	1	79	3	3.78	84	3	3.57	.21
same	-	---	-	---	---	-	---	---
almost	1	79	4	5.06	84	2	2.38	3.68
because	1	79	1	1.26	84	-	---	1.26
big	1	79	-	---	84	-	---	---
Monday	-	---	-	---	---	-	---	---
month	-	---	-	---	---	-	---	---
start	1	79	-	---	84	3	3.57	-3.57

always	3	237	8	3.37	252	1	.39	2.98
both	1	79	-	--	84	2	2.38	-2.38
cordially	-	--	-	--	--	-	--	--
expect	-	--	-	--	--	-	--	--
mean	-	--	-	--	--	-	--	--
quite	-	--	-	--	--	-	--	--
Saturday	-	--	-	--	--	-	--	--
again	1	79	-	--	84	-	--	--
Friday	-	--	-	--	--	-	--	--
something	4	316	12	3.79	336	15	4.46	-1.67
talk	-	--	-	--	--	-	--	--
though	-	--	-	--	--	-	--	--
office	-	--	-	--	--	-	--	--
Tuesday	-	--	-	--	--	-	--	--
best	1	79	4	5.06	84	3	3.57	1.49
came	3	237	4	1.68	252	12	4.76	-3.08
says	-	--	-	--	--	-	--	--
car	-	--	-	--	--	-	--	--
ground	-	--	-	--	--	-	--	--
room	3	237	-	--	--	3	1.19	-1.19
thought	3	237	12	5.06	252	3	1.19	3.87
under	-	--	-	--	--	-	--	--
board	-	--	-	--	--	-	--	--
far	1	79	-	--	84	1	1.19	-1.19
nine	-	--	-	--	--	-	--	--
without	-	--	-	--	--	-	--	--

arrest	2	79	5	6.32	84	6	7.14	.82
trip								
cent								
right								
side								
Thursday								
friend	2	79	5	6.32	84	6	7.14	.82
bad								
late								
money	5	395	7	1.77	420	11	2.61	.84
need	1	79	3	3.78	84	3	3.57	.21
still								
book								
hand								
mile								
paper								
party								
word								
madam								
six	1	79	1	1.26	84	2	2.38	-1.12
ten								
why								
perhaps	1	79	4	5.06	84	3	3.57	1.49
answer								
half	2	158			168	3	1.78	-1.78
keep								
life								

Continued:

saw	1	79	6	7.59	84	4	4.76	2.83
soon	-							
whole	-							
whose	-							
action	-							
change	-							
court	-							
follow	1	79	3	3.78	84	2	2.38	1.40
matter	3	237	8	3.33	252	3	1.19	2.14
cost	-							
February	-							
lady	-							
part	-							
reply	-							
spend	1	79	4	5.06	84	-	--	5.06
attend	-							
case	1	79	-	--	84	2	2.38	-2.38
fall	-							
however	-							
July	-							
report	1	79	1	1.26	84	1	1.19	.07
speak	-							
vote	-							
wife	-							
bring	-							
company	-							

- prompt
 - question
 - ring
 - sit
 - stamp
 - turn
 - winter
 - busy
 - folks
 - happy
 - lake
 - maybe
 1 1
 1 obtain
 - pass
 - ran
 1 study
 - become
 - December
 - dress
 - early
 1 either
 1 and
 - except
 - farther
 - heard
 - March

79	-	-	84	-	--	--
79	2	--	84	1	1.19	1.34
		2.53				
79	-	--	84	1	1.19	-1.19
79	6	7.59	84	2	2.38	5.21
79	1	1.26	84	2	2.38	-1.12

person	-	158	5	3.16	168	3	1.78	-1.38
rather	2	79	1	1.26	84	3	3.57	-2.31
water	1							
written	-							
April	-							
Christmas	-							
country	-	158	11	6.96	168	4	2.38	4.58
fact	2							
herself	-							
immediate	-							
marriage	-							
May	-							
provision	-							
reason	1	79	-	--	84	-	--	--
slide	-							
story	-							
unfortunate	-							
arrange	-							
awful	-							
complete	1	79	1	1.26	84	-	--	1.26
fire	-							
forget	-							
gave	1	79	1	1.26	84	2	2.38	-1.12
kill	-							
mere	-							
nearly	-							

Continued:

[illegible]

prison	-
toad	-
section	-
subject	-
success	-
supply	-
system	-
tax	-
allow	1
amount	1
appoint	-
expense	1
felt	-
fifth	-
fill	-
front	-
information-	-
miss	-
none	-
press	-
red	-
salary	1
secure	-
set	-
tenth	-

low	-								
mention	-								
promise	-								
result	1	79	2	2.53	84	1	1.19	1.34	
select	-								
serve	-								
soap	-								
suggest	-								
teach	-								
terrible	-								
therefore	-								
uncle	-								
absence	-								
article	-								
became	3	237	5	2.10	252	10	2.96	-1.86	
behind	-								
brother	-								
dead	-								
delay	-								
drill	-								
effect	-								
employ	-								
entire	-								
entrance	-								
extreme	-								

foot	-						
forward	-						
goes	-						
Government	-						
impossible	-						
include	-						
income	-						
increase	-						
inside	2	158	8	5.06	168	5	2.98 2.08
investigate	-						
judgment	-						
navy	-						
omit	-						
opinion	1	79	3	3.78	84	3	3.57 .21
police	-						
position	2	158	4	2.53	168	1	.59 1.94
power	-						
prefer	-						
proper	-						
push	-						
raise	1	79	1	1.26	84	1	1.19 .07
really	-						
round	-						
shut	-						
tonight	-						
total	-						

trouble	79	3	3.78	84	-	3.78
aboard						
air						
appear						
beautiful						
burn						
capture						
career						
check						
contain						
deep						
direct						
dozen						
east						
elect						
election						
engage						
express						
final						
finally	158	3	1.89	168	6	3.57 -1.68
gold						
horse						
motion						
north						
occupy						
preliminary						
principal						

proceed	-								
provide	-								
refuse	-								
relief	-								
retire	-								
shed	-								
sight	-								
south	-								
spent	-								
stopped	-								
vacation	-								
weigh	-								
wind	-								
wonderful	-								
add	-								
affair	-								
attempt	1	79	7	8.86	84	4	4.76	4.10	
black	-								
claim	-								
common	1	79	3	3.78	84	4	4.76	-.98	
convenient	-								
convention	-								
daughter	-								
declare	-								
estate	-								
event	-								
factory	-								

class	1	79	2	2.53	84	3	2.38	.15
clothing	-							
collect	-							
colonies	-							
combination	-							
comfort	-							
complaint	1	79	-	-	84	1	1.19	-1.19
consideration	-							
disappoint	-							
distinguish	-							
due	1	79	1	1.26	84	2	2.38	-1.12
feature	-							
field	-							
firm	-							
human	-							
manner	-							
neighbor	-							
progress	-							
recent	-							
sea	-							
session	-							
statement	-							
suit	2	158	1	.63	168	2	1.19	-.56
theater	-							
visitor	-							
agreement	-							

restrain	-						
royal	-						
secretary	1	79	5	6.32	84	-	6.32
spell	-						
stone	-						
summon	-						
testimony	-						
track	-						
travel	-						
victim	-						
accident	-						
addition	-						
adopt	-						
army	-						
assist	-						
associate	-						
await	-						
beginning	1	79	-	-	84	2	2.38
block	-						-2.38
blow	-						
blue	-						
born	-						
box	-						
bridge	-						
celebration	-						
center	-						
century	-						

chain -
circumstance -
citizen -
connection -
convict -
develop -
examination -

famous -
fortune -
height -
honor -
ice -
inspect -
invitation -
judge -
land -
ledge -
local -
machine -
majority -
mayor -
measure -
mountain -
national -
official -
organize -

Continued:

page	-
particular	-
point	-
population	-
pound	-
practical	-
president	-
print	-
private	2
property	158
publication-	-
publish	-
purpose	-
race	-
railroad	-
recommend	-
recover	-
reference	-
senate	-
serious	-
ship	-
steamer	-
support	-
term	-
town	-
treasure	-
vessel	-
volume	-

158 5 3.16 168 1 .59 2.57

Continued:

wire
witness
wreath

APPENDIX IV

TABLE XI. COEFFICIENTS OF TYPEWRITING DIFFICULTY MADE BY
47 UNIVERSITY STUDENTS IN BEGINNING TYPEWRITING

A		B	C		D	E	F
Ayres Spelling Scale		Typewriting Errors		Rank of words in Ayres Spelling Scale		Coefficient of Typewriting Difficulty	
Words	Frequency per 100,000 running words	Frequency	Rank				
the	6,393	298	1.	1	1.00		
and	3,438	129	3.5	2	.57		
of	3,422	129	3.5	3	.85		
to	3,217	157	2	4	2.00		
I	2,387	24	95.5	5	.52		
a	1,911	18	167	6	3.60		
in	1,904	55	19.5	7	3.59		
that	1,422	83	8	8	1.00		
you	1,306	58	17	9	.53		
for	1,241	71	10.5	10	.95		
it	1,197	96	7	11	1.57		
was	991	50	23	12	.52		
is	931	102	5	13	2.60		
will	873	66	14.5	14	.96		
as	854	38	44.5	15	.34		
have	846	71	10.5	16	1.52		
not	831	31	62	17	.27		
with	822	71	10.5	18	1.72		
be	816	69	13	19	1.46		
your	793	45	32	20	.63		
at	698	12	230	21	.09		
we	695	45	32	22	.69		
on	667	22	110.5	23	.20		
he	619	40	40	24	.60		
by	611	26	82.5	25	.32		
but	572	57	18	26	1.44		
my	557	45	32	27	.84		
this	551	53	21.5	28	1.30		
his	543	42	37.5	29	.77		
which	540	98	6	30	5.		
dear	523	15	183	31	.17		
from	488	27	78.5	32	.18		
are	468	53	21.5	33	1.54		
all	448	21	120.5	34	.28		
me	444	4	510.5	35	.07		

Continued:

A	B	C	D	E	F
so	432	25	87.5	36	.41
one	4 28	31	62	37	.60
if	408	33	57	38	.67
they	400	45	32	39	1.22
had	397	24	95.5	40	.42
has	391	39	42.5	41	.97
very	383	44	35.5	42	1.28
were	368	22	110.5	43	.39
been	370	42	37.5	44	1.27
would	362	66	14.5	45	3.11
she	359	7	361	46	.13
or	348	21	120.5	47	.39
there	341	46	28.5	48	1.69
her	311	5	453	49	1.09
an	298	11	251.5	50	.20
when	288	71	10.5	51	4.86
time	279	47	26	52	2.
go	277	10	276	53	.19
some	273	36	49	54	1.10
any	257	22	110.5	55	.50
can	250	36	49	56	1.14
what	244	44	35.5	57	1.60
send	242	3	575	58	.10
out	238	22	110.5	59.5	.54
them	238	40	40	59.5	1.47
him	233	21	120.5	61	.51
more	232	36	49	62	1.26
about	220	30	67	63.5	.94
no	220	14	200	63.5	.31
please	211	--	--	65.5	--
week	211	12	230	65.5	.28
night	206	19	136.5	67	.49
their	205	48	24	68	.83
other	203	28	74	69	.93
up	201	27	78.5	70	.89
our	200	26	82.5	71	.86
good	198	47	26	72.5	2.78
say	198	27	70	72.5	1.04
could	193	35	52.5	74	1.42
who	192	21	120.5	75	.62

Continued:

A	B	C	D	E	F
May	189	22	110.5	76	.69
letter	188	16	167	77	.46
make	185	19	136.5	78	.57
write	182	46	28.5	79	.77
thing	181	40	40	80	2
think	180	37	46.5	81	1.74
should	178	35	52.5	82.5	1.57
truly	178	15	183	82.5	.45
now	177	9	300.5	84	.28
its	175	15	183	85	.46
two	173	25	87.5	86	.99
take	172	33	57	87	1.53
thank	170	55	19.5	88	4.50
do	169	47	26	89	3.42
after	168	22	110.5	90	.81
than	167	33	57	91	1.60
sir	163	--	--	92	--
last	161	15	183	93	.59
house	160	17	155.5	95	.61
just	160	16	167	95	.67
over	160	27	78.5	95	1.21
then	159	31	62	97	1.56
work	158	60	16	98	6.14
day	157	27	78.5	99.5	1.27
here	157	19	136.5	99.5	.74
said	153	24	95.5	101	1.60
only	151	31	62	102.5	1.65
well	151	31	62	102.5	1.65
am	147	5	453	104	.23
these	146	30	67	105	1.57
tell	145	1	--	106	--
even	144	23	103	107.5	1.40
made	144	23	103	107.5	1.40
know	143	22	110.5	109.5	.99
year	143	25	87.5	109.5	1.25
before	138	20	127.5	111	.87
long	137	22	110.5	112	1.03
sincerely	135	--	--	113	--
shall	133	14	200	114	.70
sent	131	4	510.5	115.5	.23

Continued:

A	B	C	D	E	F
us	131	6	402.5	115.5	.27
give	130	31	62	117	1.89
Mr.	129	--	--	118	--
like	128	39	42.5	119	2.80
enclose	126	3	575	120	.35
next	125	18	147.5	121.5	.82
want	125	13	215.5	121.5	.57
hope	122	9	300.5	123	.41
love	121	16	167	124.5	.75
men	121	6	402.5	124.5	.31
old	118	16	167	126	.75
every	117	31	67	129	2.80
find	117	26	82.5	129	1.50
most	117	24	95.5	129	1.35
such	117	14	200	129	.65
today	117	6	402.5	129	.32
must	116	35	52.5	132	2.53
way	116	15	183	133	.72
first	115	16	167	134	.80
new	113	6	402.5	135.5	.34
seem	113	7	361	135.5	.37
morning	112	7	361	137.5	.38
school	112	15	183	137.5	.75
great	111	35	52.5	139	2.65
wish	110	15	183	140	.76
home	109	3	575	141	.24
feel	106	11	251.5	143.5	.57
glad	106	18	147.5	143.5	.97
never	106	45	32	143.5	4.49
three	106	11	251.5	143.5	.57
much	105	11	251.5	146	.58
how	103	13	251.5	147.5	.69
until	103	9	300.5	147.5	.48
many	102	25	87.5	149.5	1.70
put	102	14	200	149.5	.75
get	101	16	167.	151	.90
into	99	19	136.5	152	1.11
let	98	5	453	153.5	.34
yesterday	98	7	361	153.5	.42
come	97	9	300.5	156	.52
ever	97	29	70	156	2.23

Continued:

A	B	C	D	E	F
girl	97	5	453	156	.34
also	96	24	95.5	159	1.67
where	96	16	167	159	.95
while	96	24	95.5	159	1.67
did	95	6	402.5	161.5	.40
little	95	15	183	161.5	.88
look	94	26	82.5	163.5	1.98
respectfully	94	--	--	163.5	--
afternoon	93	9	300.5	166.5	.55
Miss	93	1	--	166.5	--
those	93	37	46.5	166.6	3.58
to	93	7	361	166.5	.46
man	92	19	136.5	169.5	1.24
own	92	11	251.5	169.5	.68
receive	91	4	310.5	171.5	.33
soon	91	9	300.5	171.5	.57
once	89	16	167	173	1.35
street	88	13	215.5	174	.81
ask	87	---	--	176	--
down	87	18	147.5	176	1.19
yet	87	12	230	176	.77
see	86	7	361	178.6	.49
since	86	16	167	178.5	1.68
cannot	85	13	215.5	180.5	.84
help	85	14	200	180.5	.91
away	93	28	74	183	2.44
course	83	11	251.5	183	.73
through	83	13	215.5	183	.85
call	82	9	300.5	185	.62
meet	82	2	--	185	--
people	80	28	74	187	2.53
another	79	15	183	188	1.03
number	78	22	110.5	190.5	1.73
place	78	21	120.5	190.5	1.58
Sunday	78	1	--	190.5	--
use	78	7	361	190.5	.53
church	77	5	453	194	.43
nice	77	3	575	194	.34
sure	77	10	276	194	.71
anything	76	11	251.5	196.5	.78

A	B	C	D	E	F
hour	76	5	453	196.5	.43
children	75	4	510.5	200	.39
don't	75	1	--	200	--
four	75	6	402.5	200	.49
kind	75	10	276	200	.73
oblige	75	4	510.5	200	.39
nothing	74	15	183	203.5	1.11
off	74	2	--	203.5	--
believe	73	14	200	206	1.03
boy	73	4	510.5	206	.40
city	73	8	328	206	.63
found	72	21	120.5	208.5	1.73
pay	72	1	--	208.5	--
tomorrow	71	6	402.5	210	.52
doctor	70	4	510.5	212.5	.42
five	70	8	328	212.5	.65
o'clock	70	1	--	212.5	--
read	70	3	575	212.5	.37
back	69	14	200	216.5	1.08
enough	69	9	300.5	216.5	.72
fine	69	12	230	216.5	.94
order	69	10	276	216.5	.78
bed	68	8	328	220.5	.67
cold	68	1	--	220.5	--
live	68	14	200	220.5	1.10
mail	68	1	--	220.5	--
few	67	10	276	223	.84
hear	66	2	--	224	--
child	65	11	251.5	226.5	.90
mother	65	6	402.5	226.5	.56
return	65	22	110.5	226.5	2.20
same	65	24	95.5	226.5	2.37
almost	64	7	361	231.5	.64
because	64	25	87.5	231.5	2.66
big	64	19	136.5	231.5	1.71
Monday	64	2	--	231.5	--
month	64	--	--	231.5	--
start	64	12	230	231.5	--
always	63	13	215.5	238	1.01
both	63	5	453	238	1.11

Continued:

A	B	C	D	E	F
cordially	63	3	575	238	.41
except	63	3	575	238	.41
mean	63	8	328	238	.72
quite	63	14	200	238	1.19
Saturday	63	5	453	238	.52
again	62	10	276	244	.88
Friday	62	1	--	244	--
something	62	7	361	244	.68
talk	62	10	276	244	.88
though	62	6	402.5	244	.61
office	61	2	--	247.5	--
Tuesday	61	3	575	247.5	.43
best	60	17	155.5	250	1.61
came	60	5	453	250	.55
says	60	1	--	250	--
car	60	3	575	254	.44
ground	59	17	155.5	254	1.64
room	59	3	575	254	.44
thought	59	15	183	254	1.39
under	59	11	251.5	254	1.01
board	58	11	251.5	258.5	1.03
far	58	11	251.5	258.5	1.03
nine	58	15	183	258.5	1.41
without	58	11	251.5	258.5	1.03
arrest	57	1	--	261.5	--
trip	57	--	--	261.5	--
cent	56	9	300.5	264.5	.88
right	56	10	276	264.5	.96
side	56	8	328	264.5	.81
Thursday	56	1	--	264.5	--
friend	55	9	300.5	267	1.22
bad	54	--	--	270	--
late	54	2	--	270	--
money	54	3	575	270	.47
need	54	7	361	270	.74
still	54	7	361	270	.74
book	53	9	300.5	275.5	.91
hand	53	15	183	275.5	1.50
mile	53	--	--	275.5	--
paper	53	5	453	275.5	.59

A	B	C	D	E	F
party	53	5	453	275.5	.59
word	53	29	70	275.5	.59
madam	52	11	251.5	280.5	1.12
six	52	5	453	280.5	.62
ten	52	19	136.5	280.5	2.60
why	52	4	510.5	280.5	.55
perhaps	51	8	328	283	1.24
answer	50	5	453	285.5	.63
half	50	14	200	285.5	1.43
keep	50	2	--	285.5	--
life	50	18	147.5	285.5	1.94
ago	49	5	453	291.5	.64
business	49	23	103	291.5	2.82
does	49	19	136.5	291.5	2.14
each	49	8	328	291.5	.89
eight	49	24	95.5	291.5	3.05
knew	49	10	276	291.5	1.54
picture	49	3	575	291.5	.56
show	49	2	--	291.5	--
build	48	7	361	299	.84
care	48	1	--	299	--
eye	48	5	453	299	.66
gentleman	48	4	510.5	299	.59
head	48	6	402.5	299	.74
left	48	5	453	299	.66
whether	48	8	328	299	.91
interest	47	2	--	306	--
January	47	1	--	306	--
present	47	4	510.5	306	.60
teacher	47	2	--	306	--
tire	47	8	328	306	.93
upon	47	19	136.5	306	2.23
young	47	2	--	306	--
done	46	30	67	312	.47
high	46	20	127.5	312	2.45
sorry	46	6	402.5	312	.73
train	46	5	453	312	.69
whom	46	4	510.5	312	.61
broke	45	1	--	317	--
during	45	10	276	317	1.15

Continued:

153.

A	B	C	D	E	F
feet	45	3	575	317	.55
itself	45	4	510.5	317	.62
several	45	4	510.5	317	.62
brought	44	7	361	321.5	.89
everything	44	6	402.5	321.5	.79
run	44	12	230	321.5	1.39
took	44	7	361	321.5	.89
better	43	6	402.5	327	.81
lost	43	8	328	327	.99
possible	43	5	453	327	--
September	43	5	453	327	.72
sick	43	2	--	327	--
visit	43	5	453	327	.72
went	43	14	200	327	1.63
act	42	13	215.5	338	1.57
begin	42	28	74	338	4.56
desire	42	6	402.5	338	.84
eat	42	--	--	338	--
guess	42	3	575	338	.59
hard	42	6	402.5	338	.84
line	42	6	402.5	338	.84
mind	42	--	--	338	--
October	42	3	575	338	.59
poor	42	2	--	338	--
remember	42	13	215.5	338	1.57
Wednesday	42	2	--	338	--
women	42	5	453	338	.75
wonder	42	--	--	338	--
conference	41	2	--	347.5	--
died	41	2	--	347.5	--
glass	41	3	575	347.5	.60
held	41	8	328	347.5	1.60
less	41	5	453	347.5	.75
understand	41	7	361	347.5	.96
along	40	8	328	354.5	1.09
August	40	5	453	354.5	.79
evening	40	7	361	354.5	.99
father	40	4	510.5	354.5	.70
forenoon	40	1	--	354.5	--
large	40	23	103	354.5	3.46

Continued:

A	B	C	D	E	F
meant	40	10	276	354.5	1.29
seven	40	7	361	354.5	.09
address	39	--	--	366.5	--
charge	39	2	--	366.5	--
family	39	4	510.5	366.5	.71
finish	39	1	--	366.5	--
hot	39	--	--	366.5	--
known	39	7	361	366.5	1.02
least	39	19	136.5	366.5	2.68
plan	39	3	575	366.5	.64
saw	39	5	453	366.5	.81
seen	39	2	62	366.5	--
whole	39	13	215.5	366.5	1.71
whose	39	3	575	366.5	.64
action	38	--	--	373	--
change	38	6	402.5	373	.88
court	38	3	575	373	.65
follow	38	9	300.5	373	1.24
matter	38	8	328	373	1.24
cost	37	5	453	378.5	.83
February	37	15	183	378.5	2.60
lady	37	5	453	378.5	.83
part	37	6	402.5	378.5	.93
reply	37	17	155.5	378.5	2.43
spend	37	9	300.5	378.5	1.25
attend	36	--	--	386	--
case	36	8	328	386	1.18
fall	36	--	--	386	--
however	36	12	230	386	1.67
July	36	2	--	386	--
report	36	3	575	386	.67
speak	36	21	120.5	386	3.21
vote	36	3	575	386	.67
wife	36	5	453	386	.85
bring	35	9	300.5	395	1.31
company	35	--	--	395	--
cut	35	--	--	395	--
member	35	11	251.5	395	1.51
November	35	9	300.5	395	1.31
open	35	5	453	395	.87
reach	35	8	328	395	1.20

Continued:

A	B	C	D	E	F
regard	35	--	---	395	--
woman	35	10	276	395	1.45
according	34	6	402.5	395	1.09
between	34	7	361	406.5	1.12
bill	34	3	575	406.5	.71
certain	34	11	251.5	406.5	1.62
copy	34	--	---	406.5	--
deal	34	--	---	406.5	--
director	34	4	510.5	406.5	--
might	34	16	167	406.5	2.42
move	34	3	575	406.5	.70
rain	34	--	---	406.5	--
small	34	18	147.5	406.5	2.75
summer	34	3	575	406.5	.70
together	34	6	402.5	406.5	1.09
against	33	6	402.5	419	1.04
clean	33	--	---	419	--
decide	33	3	575	419	.73
issue	33	--	---	419	--
Mrs.	33	--	---	419	--
near	33	4	510.5	419	.82
prompt	33	4	510.5	419	.82
question	33	13	215.5	419	1.95
ring	33	--	---	419	--
sit	33	--	---	419	--
stamp	33	8	328	419	1.28
turn	33	38	44.5	419	9.40
winter	33	--	---	419	--
busy	32	--	---	430	--
folks	32	--	---	430	--
happy	32	9	300.5	430	1.43
lake	32	--	---	430	--
maybe	32	5	453	430	.95
obtain	32	5	453	430	.95
pass	32	--	---	430	--
ran	32	--	---	430	--
study	32	--	---	430	--
become	31	19	136.5	441.5	3.23
December	31	--	---	441.5	--
dress	31	--	---	441.5	--
early	31	12	230	441.5	1.92

Continued:

A	B	C	D	E	F
either	31	8	328	441.5	1.34
end	31	12	230	441.5	1.92
except	31	5	453	441.5	.97
farther	31	--	---	441.5	--
heard	31	11	251.5	441.5	1.75
March	31	--	---	441.5	--
person	31	17	155.5	441.5	2.84
rather	31	7	361	441.5	1.22
water	31	18	147.5	441.5	2.99
written	31	4	510.5	441.5	.86
April	30	--	---	455	--
Christmas	30	--	---	455	--
country	30	16	167	455	2.72
fact	30	6	402.5	455	1.73
herself	30	3	575	455	.79
immediate	30	3	575	455	.79
marriage	30	4	510.5	455	.89
May	30	--	---	455	--
provision	30	3	575	455	.79
reason	30	6	402.5	455	1.13
slide	30	--	---	455	--
story	30	3	575	455	.79
unfortunate	30	3	575	455	.79
arrange	29	6	402.5	468.5	1.17
awful	29	7	361	468.5	1.29
complete	29	7	361	468.5	1.29
fire	29	7	361	468.5	1.29
forget	29	--	---	468.5	--
gave	29	7	361	468.5	1.29
kill	29	4	510.5	468.5	.92
mere	29	--	---	468.5	--
nearly	29	9	300.5	468.5	1.56
neither	29	14	200	468.5	2.35
noon	29	--	---	468.5	--
past	29	10	276	468.5	1.70
service	29	3	575	468.5	.82
unless	29	3	575	468.5	.82
aunt	28	4	510.5	483	.94
ball	28	--	---	483	--
character	28	9	300.5	483	1.61

Continued:

A	B	C	D	E	F
full	28	---	---	483	---
further	28	3	575	483	.84
learn	28	10	276	483	1.75
often	28	13	215.5	483	2.24
principal	28	---	---	483	--
ride	28	15	183	483	2.64
second	28	6	402.5	483	1.20
sister	28	---	---	483	--
size	28	---	---	483	--
state	28	5	453	483	1.07
thus	28	-5-	453	483	1.07
yes	28	---	---	483	--
afraid	27	---	---	496.5	--
annual	27	---	---	496.5	--
automobile	27	---	---	496.5	--
coming	27	4	510.5	496.5	.97
date	27	---	---	496.5	--
heart	27	24	95.5	496.5	.52
law	27	---	---	496.5	--
name	27	11	351.5	496.5	1.97
running	27	---	---	496.5	--
separate	27	4	510.5	406.5	.97
sold	27	3	575	510.5	.86
told	27	24	95.5	510.5	.52
although	26	5	453	510.5	1.43
among	26	16	167	510.5	3.06
association	26	---	---	510.5	--
close	26	20	127.5	510.5	3.99
club	26	---	---	510.5	--
dollar	26	6	402.5	510.5	1.20
evidence	26	---	---	510.5	--
form	26	10	276	510.5	1.85
himself	26	9	300.5	510.5	1.70
intend	26	---	---	510.5	--
June	26	---	---	510.5	--
list	26	17	155.5	510.5	3.29
public	26	---	---	510.5	3.38
station	26	---	---	510.5	--
table	26	---	---	510.5	--
true	26	11	251.5	510.5	2.03

ontinued:

	B	C	D	E	F
already	25	4	510.5	539	1.50
appreciate	25	--	---	539	--
body	25	12	230	539	2.34
clear	25	--	---	539	--
cover	25	9	300.5	539	1.79
driven	25	--	---	539	--
fair	25	--	---	539	--
getting	25	--	---	539	--
got	25	3	575	539	.94
instead	25	--	---	539	--
pleasant	25	-5	453	539	1.19
price	25	--	---	539	--
relative	25	4	510.5	539	1.05
rule	25	7	361	539	1.49
son	25	--	---	539	--
song	25	--	---	539	--
sudden	25	--	---	539	--
throw	25	--	---	539	--
war	25	8	328	539	1.64
west	25	--	---	539	--
world	25	23	103	539	5.25
accept	24	--	---	549.5	--
alone	24	4	510.5	548.5	1.08
arrive	24	--	---	548.5	--
began	24	28	74	548.5	7.40
arry	24	--	---	548.5	--
distribute	24	--	---	548.5	--
earliest	24	--	---	548.5	--
effort	24	34	55	548.5	9.99
hat	24	--	---	548.5	--
justice	24	--	---	548.5	--
lose	24	3	575	548.5	.95
lot	24	--	---	548.5	--
material	24	6	402.5	548.5	1.37
nor	24	11	251.5	548.5	2.19
sometimes	24	14	200	548.5	2.75
struck	24	--	---	548.5	--
unable	24	3	575	548.5	.96
various	24	--	---	548.5	--
anyway	23	--	---	571.5	--

Continued:

A	B	C	D	E	F
band	23	--	---	571.5	--
boat	23	--	---	571.5	--
dark	23	11	251.5	571.5	2.28
difference	23	9	300.5	571.5	1.90
door	23	--	---	571.5	--
enter	23	--	---	571.5	--
face	23	--	---	571.5	--
husband	23	--	---	571.5	--
importance	23	4	510.5	571.5	1.12
lead	23	--	---	571.5	--
light	23	9	300.5	571.5	1.90
offer	23	--	---	571.5	--
pleasure	23	--	---	571.5	--
prepare	23	--	---	571.5	--
refer	23	11	251.5	571.5	--
represents	23	--	---	571.5	2.28
rest	23	--	---	571.5	--
river	23	14	200	571.5	2.86
scene	23	--	---	571.5	--
special	23	--	---	571.5	--
stand	23	10	276	571.5	2.08
stop	23	5	453	571.5	1.26
trust	23	6	402.5	571.5	1.42
try	23	14	200	571.5	2.86
walk	23	3	575	571.5	.99
warm	23	--	---	571.5	--
weather	23	--	---	571.5	--
condition	22	--	---	598	--
different	22	8	328	598	.83
else	22	--	---	598	--
especially	22	--	---	598	--
game	22	9	300.5	598	1.99
grant	22	--	---	598	--
indeed	22	7	361	598	1.66
liberty	22	6	402.5	598	1.49
necessary	22	18	147.5	598	4.00
object	22	7	361	598	1.65
paid	22	--	---	598	--
plant	22	--	---	598	--
popular	22	--	---	598	--
post	22	--	---	598	--

Continued:

A	B	C	D	E	F
pretty	22	6	402.5	598	1.49
prison	22	--	---	598	--
road	22	3	575	598	1.04
section	22	8	328	598	1.83
subject	22	11	251.5	598	2.38
success	22	15	183	598	3.26
supply	22	10	276	598	2.18
system	22	45	453	598	1.33
tax	22	--	---	598	--
allow	21	3	575	619	1.08
amount	21	--	---	619	--
appoint	21	--	---	619	--
expense	21	--	---	619	--
felt	21	12	230	619	2.69
fifth	21	7	361	619	1.72
fill	21	--	---	619	--
front	21	--	---	619	--
information	21	--	---	619	--
miss	21	--	---	619	--
none	21	--	---	619	--
press	21	--	---	619	--
red	21	3	575	619	1.08
salary	21	5	453	619	1.37
secur3	21	--	---	619	--
set	21	4	510.5	619	1.21
tenthq	21	5	453	619	1.37
ticket	21	--	---	619	--
usual	21	5	453	619	1.37
wait	21	11	251.5	619	2.47
worth	21	10	276	619	2.24
beside	20	19	136.5	646	4.75
bought	20	--	---	646	--
builtq	20	3	575	646	1.12
buy	20	12	230	646	2.80
carried	20	--	---	646	--
destroy	20	--	---	646	--
direction	20	3	575	646	1.12
fell	20	--	---	646	--
fourth	20	--	---	646	--

Continued:

A	B	C	D	E	F
grand	20	--	---	646	--
hold	20	--	---	646	--
inform	20	--	---	646	--
lay	20	4	510.5	646	1.27
leave	20	--	---	646	--
length	20	8	328	646	1.97
loss	20	--	---	646	--
min3	20	--	---	646	--
ought	20	7	361	646	1.79
outside	20	--	---	646	--
pair	20	--	---	646	--
probably	20	4	510.5	646	1.26
ready	20	--	---	646	--
real	20	--	---	646	--
request	20	--	---	646	--
spring	20	--	---	646	--
wtay	20	--	---	646	--
stole	20	--	---	646	--
themselves	20	17	155.5	646	4.16
third	20	21	120.5	646	5.38
top	20	--	---	646	--
toward	20	4	510.5	646	1.26
watch	20	--	---	646	--
wrote	20	7	361	646	1.79
account	19	9	300.5	676.5	2.25
across	19	12	230	676.5	2.94
around	19	--	---	676.5	--
card	19	--	---	676.5	--
cause	19	--	---	676.5	--
death	19	--	---	676.5	--
divide	19	13	215.5	676.5	3.12
doubt	19	25	87.5	676.5	7.74
drown	19	--	---	676.5	--
easy	19	--	---	676.5	--
escape	19	7	361	676.5	--
free	19	3	575	676.5	1.18
gone	19	5	453	676.5	1.50
happen	19	--	---	676.5	--
hurt	19	20	127.5	676.5	5.29
led	19	--	---	676.5	--

Continued:

A	B	C	D	E	F
low	19	--	---	676.5	--
mention	19	--	---	676.5	--
promise	19	--	---	676.5	--
result	19	4	510.5	676.5	1.32
select	19	--	---	676.5	--
serve	19	3	575	676.5	1.28
soap	19	--	---	676.5	--
suggest	19	--	---	676.5	--
teach	19	--	---	676.5	--
terrible	19	--	---	676.5	--
therefore	19	3	575	676.5	1.18
uncle	19	--	---	676.5	--
absence	18	--	---	705.5	--
article	18	--	---	705.5	--
became	18	6	402.5	705.5	1.76
behind	18	14	200	705.5	3.53
brother	18	--	---	705.5	--
dead	18	--	---	705.5	--
delay	18	--	---	705.5	--
drill	18	--	---	705.5	--
effect	18	21	120.5	705.5	5.85
employ	18	--	---	705.5	--
entire	18	19	136.5	705.5	5.18
entrance	18	--	---	705.5	--
extreme	18	--	---	705.5	--
fix	18	--	---	705.5	--
forty	18	--	---	705.5	--
general	18	3	575	705.5	1.23
objection	18	3	575	705.5	1.23
perfect	18	15	183	705.5	3.86
period	18	--	---	705.5	--
rapid	18	--	---	705.5	--
region	18	--	---	705.5	--
remain	18	--	---	705.5	--
repair	18	3	575	705.5	1.23
sail	18	--	---	705.5	--
search	18	--	---	705.5	--
short	18	--	---	705.5	--
stood	18	--	---	705.5	--
suppose	18	--	---	705.5	--

Continued:

A	B	C	D	E	F
view	18	8	328	705.5	2.16
white	18	--	---	705.5	--
able	17	4	510. 2	739	1.44
above	17	5	453	739	--
assure	17	--	---	739	--
auto	17	--	---	739	--
baby	17	--	---	739	--
catch	17	--	---	739	--
duty	17	16	167	739	4.42
education	17	11	251. 5	739	2.94
extra	17	16	167	739	4.42
fail	17	--	---	739	--
foot	17	--	---	739	--
forward	17	7	361	739	2.05
goes	17	--	---	739	--
government	17	5	453	739	1.63
impossible	17	--	---	739	--
include	17	--	---	739	--
income	17	7	361	739	2.05
increase	17	--	---	739	--
inside	17	5	453	739	1.63
investigate	17	5	453	739	1.63
judgment	17	10	276	739	2.68
navy	17	--	---	739	--
omit	17	--	---	739	--
opinion	17	6	402.5	739	1.71
police	17	--	---	739	--
position	17	--	---	739	--
power	17	19	136.5	739	5.40
prefer	17	--	---	739	--
proper	17	4	510.5	739	1.44
push	17	--	---	739	--
raise	17	3	575	739	1.29
really	17	6	402.5	739	1.84
round	17	--	---	739	--
shut	17	--	---	739	--
shut	17	--	---	739	--
tonight	17	--	---	739	--
total	17	3	575	739	1.29
trouble	17	10	276	739	2.67

Continued:

A	B	C	D	E	F
aboard	16	--	---	777.5	--
air	16	4	510.5	777.5	1.52
appear	16	4	510.5	777.5	1.52
beautiful	16	6	402.5	777.5	1.84
burn	16	12	230	777.5	3.38
capture	16	--	---	777.5	--
career	16	--	---	777.5	--
check	16	13	2.5.5	777.5	3.61
contain	16	4	510.5	777.5	1.52
deep	16	3	575	777.5	1.35
direct	16	3	575	777.5	1.35
dozen	16	11	251.5	777.5	3.10
east	16	--	---	777.5	--
elect	16	--	---	777.5	--
election	16	5	453	777.5	1.72
engage	16	--	---	777.5	--
express	16	3	575	777.5	1.35
final	16	3	575	777.5	1.35
finally	16	7	361	777.5	2.15
gold	16	--	---	777.5	--
horse	16	--	---	777.5	--
motion	16	3	575	777.5	1.35
north	16	--	---	777.5	--
occupy	16	--	---	777.5	--
preliminary	16	4	510.5	777.5	1.52
principal	16	--	---	777.5	--
proceed	16	--	---	777.5	--
provide	16	--	---	777.5	--
refuse	16	--	---	777.5	--
relief	16	--	---	777.5	--
reture	16	--	---	777.5	--
shed	16	--	---	777.5	--
sight	16	4	510.5	777.5	1.52
south	16	6	402.5	777.5	1.93
spent	16	--	---	777.5	--
stopped	16	--	---	777.5	--
vacation	16	5	453	777.5	1.72
weigh	16	--	---	777.5	--
wind	16	--	---	777.5	--
wonderful	16	6	402.5	777.5	1.93

Continued:

A	B	C	D	E	F
add	15	--	---	812.5	--
affair	15	--	---	812.5	--
attempt	15	4	510.5	812.5	1.59
black	15	--	---	812.5	--
claim	15	--	---	812.5	--
common	15	4	510.5	812.5	1.59
convenient	15	--	---	812.5	--
convention	15	--	---	812.5	--
daughter	15	--	---	812.5	--
declare	15	--	---	812.5	--
estate	15	--	---	812.5	--
event	15	9	300.5	812.5	2.70
factory	15	4	510.5	812.5	1.59
favor	15	--	---	812.5	--
God	15	7	361	812.5	2.25
illustrate	15	--	---	812.5	--
injure	15	--	---	812.5	--
lesson	15	--	---	812.5	--
minute	15	4	510.5	812.5	1.59
news	15	--	---	812.5	--
political	15	--	---	812.5	--
prove	15	4	510.5	812.5	1.59
rate	15	--	---	812.5	--
soft	15	--	---	812.5	--
suffer	15	--	---	812.5	--
surprise	15	--	---	812.5	--
tree	15	8	328	812.5	2.48
wear	15	--	---	812.5	--
within	15	--	---	812.5	--
yard	15	--	---	812.5	--
age	14	--	---	839	--
athletic	14	6	402.5	839	3.08
attention	14	6	402.5	839	2.08
avenue	14	--	---	839	--
beaver	14	3	575	839	1.46
begun	14	11	251.5	839	3.33
belong	14	--	---	839	--
camp	14	--	---	839	--
cast	14	--	---	839	--
circular	14	--	---	839	--

Continued:

A	B	C	D	E	F
class	14	3	575	839	1.46
clothing	14	3	575	839	1.46
collect	14	--	---	839	--
colonies	14	--	---	839	--
combination	14	9	300.5	839	2.79
comfort	14	--	---	839	--
complaint	14	--	---	839	--
consideration	14	--	---	839	--
disappoint	14	--	---	839	--
distinguish	14	--	---	839	--
due	14	6	402.5	839	2.08
feature	14	--	---	839	--
field	14	4	510.5	839	1.64
firm	14	5	453	839	1.86
human	14	9	300.5	839	2.80
manner	14	--	---	839	--
neighbor	14	5	453	839	1.86
progress	14	9	300.5	839	2.80
recent	14	7	361	839	2.33
sea	14	--	---	839	--
session	14	--	---	839	--
statement	14	4	510.5	839	1.64
suit	14	6	402.5	839	2.08
theater	14	--	---	839	--
visitor	14	--	---	839	--
agreement	13	--	---	894	--
alike	13	--	---	894	--
allege	13	--	---	894	--
application	13	--	---	894	--
argument	13	--	---	894	--
arrangement	13	--	---	894	--
beg	13	14	200	894	4.47
chief	13	17	155.5	894	5.75
cities	13	--	---	894	--
clerk	13	--	---	894	--
command	13	--	---	894	--
committee	13	--	---	894	--
concern	13	3	575	894	1.55
consider	13	3	575	894	1.55

Continued:

A	B	C	D	E	F
contract	13	--	---	894	--
crowd	13	4	510.5	894	1.75
dash	13	--	---	894	--
debate	13	11	251.5	894	3.56
decision	13	3	575	894	1.55
degree	13	4	510.5	984	1.75
department	13	4	510.5	894	1.75
diamond	13	--	---	894	--
difficulty	13	3	575	894	1.55
discussion	13	1	---	894	--
district	13	4	510.5	894	1.75
elaborate	13	1	---	894	--
emergency	13	--	--	894	--
empire	13	1	--	894	--
engine	13	1	--	894	--
enjoy	13	6	402.5	894	2.22
entertain	13	1	--	894	--
entitle	13	2	--	894	--
estimate	13	7	361	894	2.47
experience	13	21	120.5	894	7.43
fight	13	--	--	894	--
figure	13	8	328	894	2.72
file	13	1	--	894	--
flight	13	12	230	894	3.89
flower	13	4	510.5	894	1.75
foreign	13	1	--	894	--
guest	13	--	--	894	--
history	13	4	510.5	894	1.75
important	13	11	251.5	894	3.56
imprison	13	--	--	894	--
improvement	13	3	575	894	1.55
jail	13	--	--	894	--
newspaper	13	--	--	894	--
organization	13	--	--	894	--
personal	13	4	510.5	894	1.75
piece	13	5	453	894	1.97
play	13	3	575	894	1.56
primary	13	--	--	894	--
receipt	13	--	--	894	--
responsible	13	--	--	894	--
restrain	13	--	--	894	--

Continued:

A	B	C	D	E	F
royal	13	--	--	894	--
secretary	13	2	--	894	--
spell	13	8	328	894	2.72
stone	13	2	--	894	--
summon	13	1	--	894	--
testimony	13	--	--	894	--
track	13	--	--	894	--
travel	13	--	--	894	--
victim	13	4	510.5	894	--
accident	12	--	--	959	--
addition	12	4	510.5	959	--
adopt	12	--	--	959	1.87
army	12	--	--	959	--
assist	12	--	--	959	--
associate	12	--	--	959	--
await	12	--	--	959	--
beginning	12	9	300.5	959	3.19
block	12	2	--	959	--
blow	12	--	--	959	--
blue	12	5	453	959	2.13
born	12	5	453	959	2.13
box	12	1	--	959	--
bridge	12	2	--	959	--
celebration	12	1	--	959	--
center	12	6	402.5	959	--
century	12	2	--	959	2.38
chain	12	1	--	959	--
circumstance	12	7	361	959	--
citizen	12	--	--	959	2.66
connection	12	6	402.5	959	--
convict	12	1	--	959	2.38
develop	12	1	--	959	--
examination	12	7	361	959	2.66
famous	12	--	--	959	--
fortune	12	5	453	959	2.12
height	12	--	--	959	--
honor	12	--	--	959	--
ice	12	2	--	959	--
inspect	12	--	--	959	--
invitation	12	--	--	959	--
judge	12	10	276	959	3.47

Continued:

A	B	C	D	E	F
land	12	3	575	959	1.67
ledge	12	--	--	959	--
local	12	3	575	959	1.67
machine	12	2	--	959	--
majority	12	3	575	959	1.67
mayor	12	--	--	959	--
measure	12	3	575	959	1.67
mountain	12	--	--	959	--
national	12	2	--	959	--
official	12	1	--	959	--
organize	12	18	147.5	959	6.50
page	12	3	575	959	1.67
particular	12	4	510.5	959	1.88
point	12	--	--	959	--
population	12	2	--	959	--
pound	12	--	--	959	--
practical	12	2	--	959	--
president	12	4	510.5	959	1.88
print	12	--	--	959	--
private	12	3	575	959	1.67
property	12	5	453	959	2.12
publication	12	--	--	959	--
publish	12	2	--	959	--
purpose	12	5	453	959	2.12
race	12	5	453	959	2.12
railroad	12	3	575	959	1.67
recommend	12	1	--	959	--
recover	12	1	--	959	--
reference	12	8	328	959	2.93
senate	12	1	--	959	--
serious	12	2	--	959	--
ship	12	1	--	959	--
steamer	12	--	--	959	--
support	12	1	--	959	--
term	12	2	--	959	--
town	12	8	328	959	2.93
treasure	12	5	453	959	2.12
vessel	12	1	--	959	--
volume	12	--	--	959	2.38
wire	12	1	--	959	--
witness	12	2	--	959	--
wreck	12	--	--	959	--

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* See Chapter II of this thesis.

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